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Illustrated.

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The Mining Laws

The address of Dr. George Otis Smith, director of the Geological Survey, at Houghton, Mich., Aug. 9, 1911, on "The Mining Industry and the Public Lands; Necessary Amendments to the Mineral Laws," is admirable for its sanity and its recommendations of improvements, with which most intelligent mining men will agree. We confess that we are not greatly carried away by some of the ideas that have been promoted in connection with the propoganda of "conservation," nor do we diagnose Doctor Smith as being either a visionary or a muckraker in that connection. His recommendations as a conservationist are moderate, and we think likely that we should agree with him in the main.

However, we are certainly ready to agree with him that the classification of the public land is an essential duty. Whatever be the purpose, land classification ought to have been one of the first things to have been undertaken by the Geological Survey. This duty was in fact specifically imposed upon the Geological Survey by the Act of March 3, 1879, which created it. We have frequently criticized the Geological Survey for its tardiness in performing this duty.

The recommendations of Doctor Smith that are of particular interest to us are his advice that the location of a larger unit of coal land than 160 acres for an individual and 640 acres for an association ought to be made possible; that the uncertainty about the location of deposits of phosphate rock ought to be cleared up; that the location of oil and gas lands ought to be removed from the placer law and that means should be authorized for the issue of exploratory permits; that the law of the apex ought to be abolished and a sideline law substituted; that it should be made possible to acquire metalliferous mineral land on the basis of adequate geological evidence, whether actual outcrops are present or not; that a rigid requirement of annual assessment work should be made actual and effective by inspection and supervision.

These proposed amendments have been indorsed by governmental commissions, mining societies and mining men generally. We wish that Doctor Smith had informed us what malign influence continues to make Congress inactive, but, of course, his official position would preclude him from communicating any such information, even if he possessed it. However, we think that the chairman of the committee of mines and mining of the House of Representatives might very properly rise to explain.

Rolls at the Miami Mill

It will be remembered that in planning the Miami mill the relative merits of rolls and chilean mills as regrinding machines were carefully considered. It was finally decided to adhere to the practice of the other works treating finely disseminated ore and install chile mills in two sections of the Miami plant, putting rolls in a third section as an experiment. This was done and the two systems have now been tried long enough to furnish results that are regarded as conclusive by everybody interested. This result is unfavorable to the rolls, and they are to be discarded.

The nature of the result is rather curious. The rolls were mechanically satisfactory and did what was expected of them theoretically, but in this case it proved that granularity of product was not desirable. In other words, the rolls failed to liberate the copper mineral to so satisfactory a degree as the chile mills. Although the latter are confirmed slimers, in this case sliming turned out to be what was wanted, at least in so far as comparison with the rolls went. Comparison with some other form of grinder, a tube mill for example, might be different.

The result of the rolls at Miami is quite different from what their advocates anticipated, and, in fact, from what most mill men prophesied. The tentative way in which the trial was made illustrates the

caution of Mr. Channing in the development of the Miami, and he may now appropriate credit for being slow in committing himself to a new milling system that looked good but proved to be otherwise, because of a feature entirely unforeseen.

Eastern Iron Ores

It is not so long ago that there seemed to be a general assumption that the local supplies of iron ore in the East were gradually being exhausted, and that the main reliance of northern furnaces must be on Lake Superior ores. This was not so much based on careful investigation, perhaps, as on a general impression, and on the rather vague belief that the Lake Superior regions could provide for all needs so easily and cheaply that there was no use trying to compete with them. The rising prices and gradually decreasing grade of Lake ores have had something to do with removing this impression; and the great demand for them in the Central West has brought back the attention of ironmasters in the East to the greater development of their own ores.

Of course, certain districts, like the Lake Champlain region in New York, the Cornwall and the Lehigh Valley in Pennsylvania, have held their own. In the last three or four years, however, there has been a marked revival of interest in other districts. The ores of the Hudson River district and of the northern Adirondacks in the eastern part of New York, and the Clinton ores in the central part of the State have been further prospected and developed by the opening of new mines and the extension of old ones. The old mines of the Salisbury region in Connecticut, along the southern fringe of the Berkshire hills, are being reopened. It is probable also that some of the titaniferous deposits of the Adirondacks will be opened. The old mines of New Jersey are being worked steadily, notwithstanding many predictions of their coming exhaustion. In short, it is beginning to appear that the East will be able to supply its own needs for some time to come, and that its ore resources are greater than was commonly believed.

Two or three years ago there was something like a rush to contract for Swedish and Spanish ores, but this has largely passed. The imported supplies were not so satisfactory as had been expected, and the demand for them has decreased. A few ores, like those from Wabana, in Newfoundland, have established a steady market. The Cuban iron ores have become an assured part of our supply, but they are in the hands of a few large companies, and do not find their way into the market from which eastern merchant furnaces must draw.

The Central West, backed by the Lake Superior ores, must remain the dominant factor in the iron and steel trade; but there is plenty of room in the East for a strong industry, and time and enterprise are proving that it can rely upon its own supplies of raw material. It is quite probable that the work now in progress will result in a considerable extension in our knowledge of those supplies.

Convict Labor in Mines

The discussion of the Alabama system of hiring out convicts to work in coal mines has brought out a new proposition to the effect that, instead of leasing the men to the coal companies, the State should itself lease a large coal mine, in which the convicts could be employed directly under the supervision of State officers. It does not appear that this plan will remove the objections which have been raised against the working of the men in the mines. It is not charged that the companies ill treat the men, and the main argument has been that they are put into a hazardous occupation without their own consent; many of them are unfamiliar with mining, which largely increases the risk. The new plan would simply shift the responsibility from the coal companies employing the men to the officers appointed by the State.

Steel Corporation Ore Reserves

A Congressional committee, making studies in geology is rather unusual; but the committee which is investigating the Steel Corporation seems to be now intent on finding out what the iron-ore reserves of the United States are, and how large a part of them the corporation controls. As to the ownership of the ore deposits the committee can probably make a fairly close determination, but the question of reserves is less easy. All sorts of more or less valuable expert opinions can be had, but their collection will tend only to the greater confusion of the committee. The facts and the settled policy of the Steel Corporation as to iron ores are well known, but the geologists differ widely on the reserve question.

The condition of the iron trade in the first half of the current year is shown by the American Iron and Steel Association's report of pig-iron production. In the first half of 1910 the blast furnaces of the United States made 14,978,738 tons of pig iron; in the second half of the year the make fell to 12,324,829 tons; while in the first half of 1911 there was a further reduction to 11,665,796 tons. There was some reduction of unsold stocks—which were abnormally large at the end of 1910—during the half-year, but only about enough to place the consumption on a par with that of the second half of 1910. In other words, we have been making iron for a year on the basis of 24,000,000 tons, when we have made over 29,500,000 tons in a year, and can make over 35,000,000 if it is needed. The greatest make on record was in the 12 months from July 1, 1909, to June 30, 1910, when 29,751,863 tons were reported.

In its trust prosecutions the Government seems to have made its ten-strike in the wire cases. In these there was no long drawn out legal battle. When the indictments were handed down the culprits expressed their indignation, but soon they cooled off, pleaded guilty in a form that perhaps assuaged their feelings—but was an admission of guilt nevertheless—and quietly paid the fines of $1000 per man levied against them, all except E. E. Jackson, Jr., the supervisor of the pools, who paid $45,000, and apparently was glad to get out of the scrape so easily. So far 74 out of the 84 men indicted have pleaded and paid and the Government has collected $136,700. The trouble with the wire men was that the Government had a dead open and shut case against them.

The wind seems to be escaping from the Hollinger balloon and the quotations for that Porcupine stock are sinking toward the basis of actual value. The recent manipulation of this stock to about $16 and the unloading of a large block do not reflect credit upon a certain mining house if what is whispered be true.

Metallics

A crystal of mica found in the Iotla Bridge kaolin and mica mine in Macon county, North Carolina, in 1907, measured about 29x36 in. across and was 4 ft. thick.

A good paint for stacks and boiler fronts is asphaltum cut down with turpentine to the right consistency. Coal-tar mixed with graphite and thinned with turpentine is good also. Steam pipes used for heating should not be painted, but can be given a thin coat of lampblack and linseed oil, which will greatly improve the appearance.

The International Nickel Company during the last year installed a 70-ton basic converter at its smelting works at Copper Cliff, Ontario, this replacing three of the smaller acid converters. The economy has been so great that the company is now installing three more basic converters, which will result in the abandonment of the old practice and will effect a large saving. The company is also installing a reverberatory furnace plant for the treatment of fine ore and the flue dust from its blast furnaces.

At the tailings retreatment plant of the Oroya Brownhill Company vacuum filters are used, each vat containing 34 frames 5 ft. 3 in. deep by 9 ft. wide and set 6½ in. between centers of frames. Each vat has a filtering area of 3213 sq.ft. The frames will carry an average weight of 22 short tons of dry slime at a charge; the cakes are 1⅞ in. thick and contain 13.71 lb. dry slime per sq.ft.; 33 filter charges are usually put through the two vats in 24 hours, the time for each charge being made up as follows: Filling with pulp 5 minutes; forming cake 30; emptying excess pulp and putting in wash 8; washing 30; emptying excess wash 4, opening and closing discharge doors and dropping cakes 7, a total of 84 minutes.

Preparations for removing paint and varnish are costly and are easily wasted by one not familiar with their use. The proper, as well as most economical method, is first to coat the surface all over, not a little patch, but the entire surface. Let it remain on for some time, then try it; if the stuff is well loosened, scrape it off. If not, do not scrape, but give it another coat. In this way the entire old coating will come loose, and may be easily removed. By doing little patches and not giving the remover time to get at the bottom of things, material is wasted. Keep the can containing the remover well closed, for it is volatile, escaping readily. These removers act slowly and cannot eat at once through several old coats of paint or varnish. If the coats were of recent formation it would at once curl, and then be easily scraped or even wiped off. Use a wire brush when you cannot readily use a scraper, after applying the remover.

By the Way

Anybody may make a mistake, but it is only a fool who makes the same mistake twice. That is even foolish of a fool, when there are such infinite varieties of mistakes to choose from.

A Wall Street broker is reported to have bought up steel stocks on the news of indictment for conspiracy of about 80 men prominent in the trade. He is a humorous optimist, who reasons that if the prosecution fails stocks will recover and he will make a profit, and if it succeeds there will be such a demand for steel bars for prison purposes that stocks will go up even higher.

In July, the Federal grand jury returned indictments against A. L. Wisner & Co., both as a firm and as individuals. It will be remembered that the offices were raided last March by post-office inspectors. Seventy-three overt acts are charged in connection with the sale of stock in the United Tonopah and Goldfield Mines, Ltd. The way of the transgressor is getting harder.

Tin and Crime—According to a consular report, 117 persons, chiefly habitual criminals, were banished for life from Perak last year. Of these, 99 were Chinese, 12 of whom had been convicted of participating in unlawful societies. It was discovered that the number of prison offenses varies in indirect ratio with the price of tin. When tin is high and the industry accordingly prosperous, inmates of jails are few, and *vice versa.*

D. C. Jackling is credited with the following remark in a recent interview: "At no time since I have been in the copper business have I known stocks (of copper) to be so low as at present. When industrial conditions improve, this will have its bearing." It is hard to see why Mr. Jackling should make such a statement. Stocks were very much lower in the early part of 1907, and he was engaged in the copper business before that time.

It is reported that J. J. Hill has recently voiced the opinion that "there would be no trust, in the accepted meaning of the term, if we had a Federal law requiring every corporation to prove that its capital stock is fully paid up before it is allowed to do business in any of our States." We wonder how many mines, now producing, would never have been started if such a law had been in effect 30 years ago, or more to the point, how it would have affected certain railroad properties in which Mr. Hill is interested. Now that I have it all, let us advocate a law preventing anyone else from getting anything.

In the days of auld lang syne, there were dividends a-plenty from the mines of the Comstock lode, but "Irish" dividends have been the only sort that have been paid in later years. It is therefore of interest to chronicle the declaration of a "real" dividend by a Comstock company and it must be a bewildering surprise to Comstock investors who have been patiently paying assessments for so many years. The payment now is by the Mexican Mining Company, which has declared a dividend of 10c. per share from its recent operations, and promises to pay more from the newly opened orebody. The Consolidated California & Virginia paid two dividends of 25c. each back in 1895, and the Ophir one in 1904; since then the record shows only a long and continuous line of assessments.

A woman is now acting director of the U. S. mint. On Aug. 1, Miss Margaret V. Kelly, who had been adjuster of accounts in the mint bureau, became the highest salaried woman in the Government's service on being appointed by Secretary MacVeagh as "examiner of mints," virtually assistant director of the mint. In this new position Miss Kelly will be drawing $3000 per year, and will be acting director of the mint for several months, in the absence of Director George E. Roberts, who left Washington on an extended trip soon after the appointment of Miss Kelly. Miss Kelly is a native of New Hampshire and entered the mint bureau 14 years ago; she has held successively the position of stenographer, private secretary to the director, adjuster of accounts, and examiner.

A certain coal-mining company in Indiana has inaugurated a plan of employment that is being resisted by the miners. The company has prepared a form which the miners must sign before taking employment at any of the company's mines. Among other things the form contains the following questions: "What is your name? Your certificate number? Your age? Your nationality? Married or single? If married, how many children have you? Is your hearing impaired? Your sight impaired? Do you get drunk? How often? Will you agree not to go near the mine while under the influence of intoxicating liquors, or use the same while there? Were you ever discharged? If not discharged, why did you quit? Were you ever injured in a mine? Did you ever sue or threaten to sue any company? If so, what for? Have you ever received any money from an employer for an injury or loss of time? Were you ever fined or discharged for loading dirty coal?" The miners say that such contract conditions are a departure from the present joint contract, and are odious. How would you like to fill out such a blank? It reminds us of some of the omnibus blanks in use in certain mines where one signs away all his rights to secure the opportunity of working. Fortunately the juries usually overlook this fact in case of injury.

Utah Copper Quarterly Report

According to the thirteenth quarterly report of the Utah Copper Company, covering the second quarter of the year 1911, the total output of copper contained in the concentrates of the mill was 24,469,-812 lb., as compared with 21,296,709 lb. during the preceding quarter. The three months of the second quarter contributed to the production as follows: April, 8,-169,248; May, 8,391,879; June, 7,908,-685 lb. The average monthly production during the first two quarters of 1911 was 7,627,753 lb., as compared with 7,563,940 lb. per month during the last two quarters of 1910.

The average cost per pound of copper produced during the second quarter of 1911, after deducting for smelter treatment and without crediting miscellaneous income, is reported at 8.02c. as compared with 8.424c. during the preceding quarter-year. The total quantity of ore treated during the second quarter was 1,000,414 tons, of an average assay value of 1.6332 per cent. copper, as compared with 981,194 tons, of an average grade of 1.3509 per cent. copper, during the preceding three months. The average extraction during the second quarter was, therefore, 70.64 per cent., which average includes some of the poorer work done by the eight stamp-mill sections of the Arthur plant, which were operated for a part of the period.

The Magna plant was operated for the entire quarter. The Arthur plant was not operated to full capacity, but only to such extent as necessary to take care of the excess of ore production above the capacity of the Magna plant. The remodeling of the fourth section of the Arthur plant was completed by the end of the quarter, and as the operation of the remodeled section shows that the capacity of the four now in commission is about the same as that of the 13 original sections of that plant, the stamp-mill sections have been permanently closed down. Other sections of the Arthur plant will be remodeled to keep pace with ore production.

In order to be able earlier to discontinue underground mining and at the same time increase tonnage, stripping operations at the mine are being vigorously pushed, with the result that during the last quarter a total of 1,395,504 cu.yd. of capping was removed from both the Utah and Boston groups, as compared with 957,149 cu.yd. for the first quarter of 1911. Another object in crowding stripping work now is to put the mine in first-class condition for production during winter weather and to avoid the necessity of heavy stripping at increased cost under adverse weather conditions.

All of the grading work on the main line of the Bingham & Garfield railway was completed about June 1, but the work on the steel bridges was delayed to some extent by high winds, and the track was not laid across Dry Fork bridge until July 14. The grading of the branch connection to the Garfield smeltery has been completed. Shipment of equipment has been delayed, but two locomotives and some of the cars were shipped about the middle of July, and it is now expected to begin operations on the railway in the month of August.

The following statement shows the financial results of the company's operations for the quarter:

Net profits from milling	$983,677
Additional income from rents and miscellaneous sources	8,080
Income from Nevada Consolidated Copper Company dividends	375,187
Total net profit for the quarter	$1,366,944
Dividends paid	1,177,012
Net surplus for the quarter	$189,932

The above earnings are computed upon the basis of 12¼c. per pound for copper. At the end of the quarter, no copper due for delivery from refineries remained unsold.

Nevada Consolidated Report

The Nevada Consolidated Copper Company produced 15,677,065 lb. of copper during the three months ended June 30, 1911, as compared with 15,893,-743 during the preceding quarter-year. The output for each month was: April, 5,298,632; May, 5,277,355; June, 5,101,-078 lb. The average of the first nine months of the fiscal year has been 5,-252,156 lb. per month. During the last quarter the ore treated averaged 1.59 per cent. copper, the lowest grade milled since the beginning of operations. This was due to the inclusion of a large tonnage of low-grade material which had to be removed for the exploitation of the Eureka pit, but was too good to be thrown away as waste.

At the beginning of the quarter the directors decided to reduce the price at which unsold stocks of copper had been carried on the books to accord more nearly with the facts; for this purpose a sum of $23,826 was deducted from the quarterly earnings and added to the metal price reserve account. Copper stocks are now carried on a basis of 12.25c. per lb., which is less than the price now being received.

Work at the Liberty pit progressed satisfactorily, but the only ore treated from this pit was that which had to be removed as stripping. During June, all reverberatories in operation were running with oil fuel, except one which is still fired with oil and coal combined. The results have fully justified the installation of oil as fuel at the Steptoe plant.

A condensed profit and loss account for the quarter-year ended June 30, 1911, follows:

Net earnings from mine, investments, etc.	$886,266
Depreciation of Steptoe plant	$136,990
Dividend No. 7	749,389
Total deductions	$886,379
Deficit charged against undivided profits	$113

The company's property is valued at $5,479,025 and its investments at $10,-900,000. Its surplus at the end of the period was $9,056,153 and the sum of $2,159,310 remains on the books as undivided profits.

Bituminous Coal Trust Suits

The law officers of the Federal Government have begun suit against a number of railroads and coal companies, alleging combinations in restraint of trade and violation of the anti-trust law. The defendants are the Lake Shore & Michigan Southern, the Chesapeake & Ohio, the Hocking Valley, the Toledo & Ohio Central, the Kanawha & Michigan, the Zanesville & Western railroads, and the Sunday Creek Company, a coal corporation; the Continental Coal Company, and the Kanawha & Hocking Coal and Coke Company.

The roads and the coal companies have been affiliated. Until recently the Hocking Valley, the Toledo & Ohio Central, the Kanawha & Michigan, and the Zanesville & Western were held jointly by what was known as the Trunk Line Syndicate. The properties were then divided between the Lake Shore & Michigan Southern and the Chesapeake & Ohio. The Hocking Valley controlled the Sunday Creek Company, which in turn controlled a large number of subsidiary coal companies doing business in Virginia, West Virginia and Ohio.

The charges are, in substance, that the defendant railroads practically own the coal companies, whose output they carry; that the combined companies control the business of important coal districts in Ohio; and that they discriminate in rates and distribution of coal against other companies which are outside the combination. In brief, that they constitute a trust in Ohio coal, with which other companies cannot compete. Various contracts and agreements are filed in support of these allegations.

Suits are already pending in the Ohio courts against the Hocking Valley Railroad Company and the Sunday Creek Company, in which discrimination in rates, car supply, etc., is charged. These suits were brought before the recent changes by which the Hocking Valley road passed under the control of the Chesapeake & Ohio company. The Hocking Valley district is the most important in Ohio.

Correspondence and Discussion

Items to Be Charged against Broken Ore

A remark at the end of an article describing the method of mining Swedish iron ore, in the JOURNAL of Feb. 25, raises a point of interest to all managers using the filled-stope method of mining or methods analogous thereto. "Then, too, a period of three to ten years may often elapse while the ore in a given stope is being broken; with a rich ore, the loss of interest on such 'idle capital' might be serious, but it is less so in the case of an iron ore."

It is apparent from the context that the writer of the extract considers that the "idle capital" must be taken to mean not only the money expended in developing the stope and breaking the ore, but also the profit that will accrue from the sale or treatment of the ore, for if this is not his meaning it is hard to follow how the value of the ore affects the question in the least. This idea that interest must be charged upon the profit that will come from the treatment of the ore while it is lying broken in the stopes, seems to me to be an erroneous one.

PROPER CHARGES AGAINST BROKEN ORE

It is, perhaps, worth while to consider what are the proper charges that can be debited against broken ore while lying in a mine. I think it is clear that there should be some interest charged against it and the question only remains upon what sum it should be calculated. It is of importance as this interest, worked back to per ton of ore mined, must be reckoned with when considering the advantages and disadvantages of this class of mining, and, if profits are to be considered, will be quite big enough to affect the choice of a system of mining. The capital to be considered can be arranged under three heads: (1) The cost of developing the stope plus the cost of actually breaking the ground plus the profit to be made on the ore lying broken. (2) The cost of developing the stope plus the cost of breaking the ore. (3) The cost of actually breaking the ore.

(1) It is surely wrong to consider the profit to be earned from the ore. This can only be properly charged against the ore if it is purposely being kept back to await a more favorable opportunity to realize the product, and in some few cases this may be so; but at any rate with gold and the base-metal mines it is usual to find the plant belonging to the mine working at its full capacity even while the broken ore is lying in the stopes. The ore is not lying underground primarily because the property is under-equipped

Views, Suggestions and Experiences of Readers

with plant, but because it is claimed that this method of mining in that particular mine gives the best results from a mining point of view. The question of charging interest from the profit available from a known body of ore existing in a property is an important one to consider when determining the proper rate of working the mine, and is one of the main points that will finally determine the size of the plant, but it can hardly be charged against the cost of mining. If interest can properly be charged on the profits to come from broken ore lying in the stopes, then it can with equal justice be charged on the profits to come from the whole of the known ore reserves because a mine properly developed to be worked by the filled-stope method, has only as much broken ore left in the mine as enables mining to proceed with the required regularity of output. The working of the stopes is so arranged that actual stoping is about finished in a new stope at the same time that a filled stope is emptied. The whole of the broken ore cannot be considered by any means as available immediately for either treatment or sale as it would be impossible, without materially interfering with the working of the mine, to draw the ore out of a stope until it has reached either the limit of the ore or the level above. This being so, there is no more reason to charge interest upon profit to come from the treatment of this broken ore than there is to charge interest upon the profit to come from the whole known ore reserves of the mine and no one would for a minute consider that this would be a fair charge against the mining of the ore

INTEREST ON LOCKED-UP CAPITAL

(2) Should interest on the cost of development of the stope be charged? To a certain extent it certainly should, as it is quite clear that this class of mining requires development to be more advanced than with the class of mining where the whole of the ore as broken is taken to the surface. But this item would be such a small one that it is hardly worth considering. Of course the cost of developing a mine has to be distributed on a tonnage basis over the product of the mine, but this applies equally to all methods of mining and will be much the same under the same physical conditions whatever class of mining is employed.

(3) What has to be charged to mining in this class of stoping is clearly the actual cost of breaking the ore that remains in the stope. Not the cost of mining, because the greatest part of the total cost of mining has yet to be expended, i.e., shoveling, tramming, hoisting, filling, etc. The only costs that have so far been incurred are those of boring, shooting and maintaining passes through the ore for traveling ways. This capital has certainly been expended and it is lying idle and interest upon it is clearly a fair charge and one that has to be considered when making comparisons with other systems.

On the whole, with rich companies having plenty of capital available, it will not be found of sufficient importance, as a rule, to have much of a bearing upon the decision of the system of mining to be employed, but it will be the physical features of the deposit that will largely determine the question. With small companies, however, developing a mine with barely sufficient capital and not good credit, it will be found that this question of the amount of capital that is locked up in the mine is an important one and the failure to appreciate it may be disastrous to the company. In these last cases it will not be the amount of interest upon the capital so locked up that will be the important thing, but the fact that the capital itself is needed for other work about the mine. Nevertheless the fact remains that when mining engineers quote the costs of mining this item of interest on locked-up capital should be taken into consideration if the costs are to be of use in the way they should; i.e., in a condition to compare with the costs of other systems of mining so that it is possible to compare the good points of all and decide which system under given conditions it will be most advantageous for the mine owners to introduce.

J. BOWIE WILSON.

Sydney, N. S. W., June 11, 1911.

The Fire at Porcupine

The recent fires at Porcupine, attended by great destruction of property and loss of life, have drawn attention to new sources of danger at mines surrounded by forest- and brush-covered land. The greater number of mines are situated in places where there is little brush and timber to dry and become a menace through forest fires, so that the catastrophe at Porcupine, while it might have been anticipated, probably was not.

The accounts of the fire state that much combustible dust was carried into the air

by the draft, thence blown along in advance of the fire itself, which did not advance so much by creeping along the ground as by the bursting into flames of these "combustible clouds" that spread the fire across wide clearings. Clearings proved of no avail in checking the spreading of the fire, and when a building caught fire, the flames shot from all parts at once.

The clouds of flame and waves of intense heat quickly surrounded the men who attempted to put out the burning structures, so that many were cut off and lost their lives while others could do nothing to check the destruction. About the only place of refuge, according to the report, was the lake, to which many fled, and scores lost their lives there by upsetting of boats and inability to swim.

At the Dome mine, Ambrose Monell is personally superintending construction work. He has been quoted as saying that in the future subterranean chambers should be provided in which miners may take refuge in the event of another such fire. These chambers should be well ventilated and furnished with a supply of water. To them the men could turn for refuge at the last moment, when it is no longer possible to defend property.

JOSHUA SCHREIBER.

Toronto, Ont., Aug. 3, 1911.

A Plea for a Square Deal

At present the Government discriminates against the mining industry and thus does the prospectors and mining men injustice. The farmer can get the best 160 acres of Government land that he can find in the country as a homestead for nothing and many of the stock men secure thousands of acres of mountain land for a few dollars. They hire a man to work and suggest that he might as well file on some land, that the one who worked for them before took 160 acres and that they bought it from him. The laborer takes the land, builds a shack on it, sleeps there when convenient and keeps on working for his employer until he gets the land patented and sold to his employer; then he is discharged and another man is hired and the process is repeated. This is legitimate as no agreement need be entered into. Large tracts are actually secured this way. A desert claim of 160 acres can be had for $1.25 per acre and a little work. When a man wants a timber claim of 160 acres he can get it for what the timber on it is worth or less, without work. When land is located according to any of the above methods, the locator is protected and the land surveyed by the Government. The prospector who wants 160 acres of mining ground has to find the ore in place on every 20 acres; sink a shaft 4x6x10 ft. on each; measure them out, stake them and file on each 20 acres. Then he has to do $800 worth of work on the land every year until it is patented, which cannot be done until at least $500 worth of work is done on each claim or $4000 for the 160 acres. Even if his land occupies but a quarter section, he cannot take it that way. He must employ a surveyor appointed by the Government and he must pay him about $1200. The surveyor must make his oath that the veins cross the end lines of every claim at right angles, which in 99 cases out of 100 he does not know and in most cases he has reason to believe that they do not, as veins seldom run straight for a great distance.

I had two claims surveyed for patent some time ago, on **which** over $60,000 worth of work was done. It cost me over $300, for the surveyor had great trouble in getting the surveyor general to accept his survey, because, according to the surveyor general's opinion, the vein was not at right angles with the end line. No work was done at the end and no one knew for certain whether it was at right angles or not. The surveyor had to take his oath that it was before his work was accepted. Such a law is absurd. When so many mines have parallel veins and cross veins all over the ground, a 40-acre tract following the Government survey would be much better and save the poor miner $7.50 per acre for surveyor's fee, $3.75 per acre for attorney's fee and $1.50 per acre for Government fee; so he would be required to pay only for the advertising and the Government price of $5 per acre for the land.

WHAT A PROSPECTOR DESERVES AND WHAT HE GETS

It generally takes from $50,000 to $1,000,000 to develop a mine and put it on paying basis, yet the prospector, single handed, attempts this Herculean task. Prospectors spend most of their lives alone in the mountains, working hard from month to month and from year to year, driving their tunnels through the rock to reach the vein or to follow it, hoping and expecting continually to strike ore rich enough to ship to the smeltery and obtain money to install the necessary machinery to make the mine profitable, or to show enough gold to induce someone with money to buy and operate it. They make trails and wagon roads into the heart of the mountains and thus open the country which could not otherwise be done except at an enormous expense to the Government. They discover gold, silver, copper, lead and other minerals necessary to the prosperity of the country.

So metals are taken out that benefit mankind which otherwise would remain undiscovered. But the majority of the prospectors die and are taken from their poor huts to their graves before anything of much value is taken from their mines. After the prospector has worked faithfully on his mountain claim for six or ten years, it would not be much for the Government to give him or sell him at least one tract of 40 acres on the same terms as it does to the homesteader. But not only this is denied him, but after he has spent the best part of his life and all his money developing his mine, a land shark may come over the road he so laboriously made and go into the miner's cabin and locate a homestead or desert claim over his ground, claiming that it is more profitable for farming than for mining. The Government does not protect the miner's right. The miner and not the land robber must go to the trouble and expense of proving the value of the land or lose the result of all his work. While the miner has enough confidence in his mine to spend his time and money on it, and pay $5 per acre for it, why should it be taken from him and given to another for nothing?

HOMESTEADING MINERAL LAND

This is no vague theory; it often occurs in actual life. The Oregon Freegold Mining Company, for instance, bought several quartz claims in Lost Basin, Baker county, and spent over $18,000 in developing the mine, took out ore that averaged $184.75 and shipped it to the smeltery, built a little mill to test the ore and milled several hundred dollars worth of the ore, and were working the mine every year developing it. Last year they bought a 10-stamp mill. Yet while the miners were doing this, two unprincipled men went there and filed homesteads over much of the ground. The company had driven a tunnel 40 ft. long in February and March, last year, to crosscut the vein; yet knowing that the work had been done, in July of the same year, Jack Young filed a homestead on that land and fenced it. I reported the case to the Land Office at Burns and also to L. L. Sharp, chief of field division, Portland, Ore. Early last spring, W. R. Davey, one of the force, went to look at the property and he said that we would no doubt hold the land. But nothing has been done yet to oust Young from our grounds. Again, on May 31, of this year, Rose L. Chamberlain homesteaded the ground we had located as a mill site and some of our claims in which we had opened a high-grade vein. It was known that the ground was located as mining claims and that much work had been done there. These people went to our boarding house and took our things out and put their own things in. Such injustice perpetrated and allowed to stand for months is wrong and encourages other land thieves and other troubles. The last outrage was reported to Mr. Sharp, July 11, and no word has been heard from him since. He may be busy with other cases where land sharks locate over mining claims.

W. J. HUGHES.

Prairie City, Ore., July 28, 1911.

Details of Practical Mining

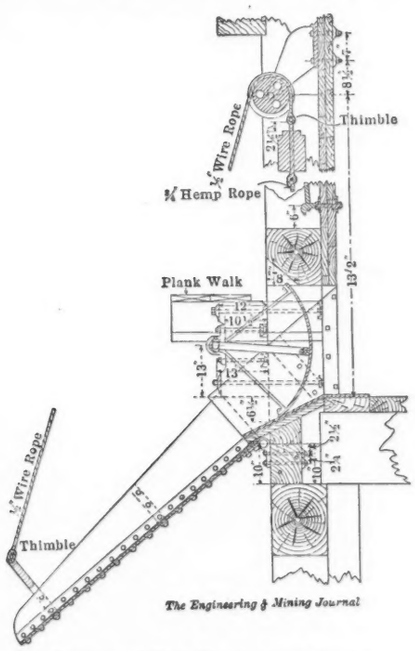
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

An Arc Type Ore Bin Gate

BY P. E. BARBOUR*

The accompanying sketch shows, in section, an ore-bin gate and chute, used at the Topliff quarries in Utah for loading limestone into railroad cars for shipment to the Salt Lake smelteries. The chute is hinged on an axle at its upper



ARC-TYPE ORE GATE AND CHUTE

end, and the lower end can be raised or lowered to any desired hight, by means of a wire rope, which is attached to the lower end and which passes over a pulley and is fastened to a counterweight.

The gate itself is in the form of an arc of a circle, and swings on an axle at its center. The circular face, which the gate presents to the rock in the bin, reduces the dufficulty of opening the gate against the pressure of the rock within. One criticism might be made regarding the position of the gate as shown. The axis is a little too high, with the result that small rocks or lumps of ore can become wedged between the lower lip of the gate and the bottom of the chute, making its opening difficult.

*Mining engineer, Tecoma, Nev.

A Cone Friction for Mine Hoists

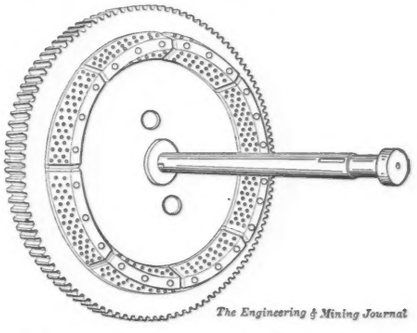
Friction hoists are used at mines because they are usually the simplest and cheapest hoists that can be built. When two drums are mounted on one shaft for hoisting in balance, it is often desirable to work one drum while the other is at rest and one of the methods of transmitting motion from the engine to these drums is by means of a friction gear. The friction hoist finds its widest application in mining where heavy loads are raised while the engine is using steam and light loads are lowered at a speed controlled solely by the brake and friction gear, no steam being used in the engine. Most friction hoists are not built with reversing engines unless occasional heavy loads are to be lowered. Hoisting through winzes where rapid return of the empty bucket is a requirement is a typical use of the friction hoist.

TYPES OF FRICTION HOISTS

There are two types of friction gear more widely used than others for driving hoisting engines, the band and cone frictions. The band friction consists of two semi-circular bands of wrought iron that carry wooden shoes and which can be tightened to grasp the drum in a manner exactly similar to the operation of a band brake. The cone friction consists of a ring, in shape like the frustrum of a hollow cone, which is bolted to the part of the hoist actuated by the engine through gears. This cone engages a similar larger cone bolted to the drum. Where one such ring is used on the drum the gear is termed single cone friction; if there are two rings, one of which engages the outside and one the inside of the engine cone, the gear is called a double cone friction. The engine cone is therefore male and the drum cone female. Contact is made and broken by shifting the drum laterally upon its shaft. Such lateral movement of the drum varies from 1/32 to ⅛ in. and is effected through a hand lever operating shifting devices that vary in construction in hoists of different manufacture.

SIMPLE WOODEN AND IRON CONE FRICTIONS

In the earlier forms of friction gear two metal surfaces were employed but when any slip occurred the amount of heat developed was excessive. This form was succeeded by that in which one member was made of wood and the other of iron or steel. In the double cone hoists the male cone is made of wood and the female cones of iron as it is easier to replace the male cone when worn out; the wooden cone of course wears more rapidly than the metal. Some manufacturers make the wooden cones so that the friction surface is against the grain of the wood as such a surface wears longer; the surface parallel to the



A HOIST FRICTION WITH CORK INSETS

grain gives a better hold and as replacement of the cone is easy some manufacturers prefer to use this surface and change cones more frequently.

Single cones can be adjusted as they wear but this is compensated in part by the greater amount of wear they are subjected to over double cones. The object of making the gears in the form of a truncated hollow cone is to get sufficient surface of contact and reduce the amount of end thrust. The best angle, for the face of these cones, as determined by experiments, is 30 deg.; that angle is best for quick release and brings the least pressure against the mechanism for shifting the drum on its shaft.

WOODEN CONES WITH CORK INSETS

An improvement in wooden cones is shown in the accompanying illustration. The two surfaces of the wooden male

cone that engage the iron surfaces of the female cones are bored, staggered as shown. Into the holes cork cylinders, a little larger in diameter than the holes, are forced under pressure so that they bulge above the level of the wooden surface. The convex surfaces of the cork insets are then planed flat but allowed to project about 1/32 in. above the wooden surface of the cone. A peculiar fact noted in the use of these insets is that while both wood and cork surfaces eventually wear the corks always protrude about the same amount until the cone is worn out—due, no doubt, to the squeeze to which the cork is subjected by being forced under pressure into a comparatively small hole.

In the cone with cork insets, the holding power on the drum is increased about 100 per cent. This means that the hoisting engineer has only to exert about one-half the pressure on the lever to hoist the load. The cone withstands the effects of heat better than the plain wooden cone, in fact the cork will not burn so readily as the wood and as the drum does not slip as much as with wood, the cone is more durable. Oil and water do not cause slipping to anything like the extent that they do with a plain wooden surface. The cone also takes hold and lets go more quickly.

Conditions of Efficient Friction

The efficiency of a friction cone has nothing to do with the elasticity of the materials, but with the character of the surfaces in contact. The good results obtained by the use of cork insets seem to indicate that a yielding surface is an advantage, but in the light of more recently developed friction devices this is not proven to be the case in all instances.

Steel Drill Derricks

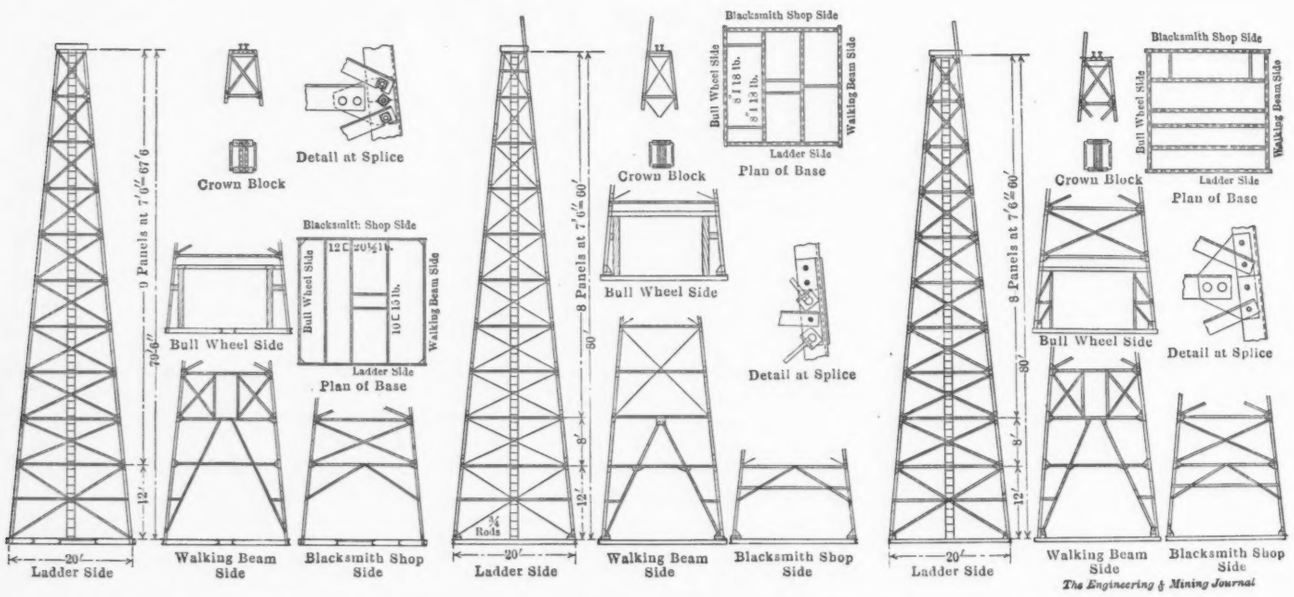
In order to meet the requirements of deep well drilling, as well as the other various uses to which the steel derrick is put, three different forms are now manufactured in standard hights of 55, 64, 72 and 80 ft., two with rigid angle bracings and one with the diagonals made of rods, designated respectively after the names of their inventors as the Yorke, the Woodworth Standard and the Woodworth-Oklahoma, which are described by R. B. Woodworth.

The Yorke steel derrick was first made with the legs of structural-steel angles overlapping each other at the joints and the derrick so constructed was completed on Jan. 7, 1909. The joints are now made abutting. Connection gusset plates are riveted to the angle girts and are provided with slotted holes at the top and bottom with a round hole immediately at the joint. The diagonal members are likewise made of angles which are slotted at the ends to fit over the bolts, which pass through the gusset plates and the legs. The bolts are put in the leg members and after the first insertion it is not necessary to remove them; the derrick is assembled and dismantled simply by loosening the bolts and by slipping the slotted portion of the gusset plate over the bolt in the leg below and the legs of the upper sections over the slots in the gusset plates of the lower section. The diagonal members are then slipped over the bolts, which are tightened, and the joint is complete.

The Yorke derrick depends for its stability under overturning stresses or against the pulling in of the derrick by eccentric pulls on the casing on the friction at the joints assisted a little by the way in which the slots are made in the diagonal members. This principle did not seem satisfactory at first glance, but the number of Yorke derricks which have been erected and placed in successful operations, been dismantled and re-erected, has demonstrated conclusively that as a matter of actual practice sufficient strength and stability are obtained in that way.

The Woodworth standard derrick is made of structural shapes for legs, girts and diagonal braces, but differs from the Yorke derrick in that dependence is placed for strength, not on the friction of the joints, but on the shearing and bearing value of the bolts, the legs and diagonal members being connected to the gusset plates of the girts in the same manner as is customary in building and bridge construction generally. The derrick cannot be pulled in or overturned until the bolts are sheared off. The difference, as compared with the Yorke derrick, is that the bolts must be put in and completely taken out every time the derrick is dismantled, though, of course, they remain in one of the members after the nuts have been screwed on.

The Woodworth-Oklahoma derrick is made with the legs and girts of structural angles, but with the diagonals of round rods of different thicknesses, depending upon their position in the structure. No turnbuckles are employed with the rods, as the use of turnbuckles has not met with favor from the drillers. The rods are threaded at their ends, run through holes in angle clips and are adjusted in place by nuts. These derricks are rigid. They will not spring and weave like a wooden derrick under heavy loads, but, with the crown block in the center and the loads distributed on the four legs of the derrick as it should be, will sustain



THE YORKE, WOODWORTH-STANDARD AND WOODWORTH-OKLAHOMA STEEL DERRICKS

safely any strain which ordinary drilling conditions may bring upon them. Already wells 3800 ft. deep have been drilled with them.

Any one of these three types of derricks ought to be erected complete with crown blocks, ladders and base by four workmen in one day, and the workmen need no equipment for putting them together except a few wrenches apiece, large enough to take ⅞-in. bolts.

The steel used in the construction of the derricks and drilling rigs is that usually employed in bridge and building construction to manufacturers' standard specifications, and the loads are figured on the ordinary factor of safety of four used in structural-steel work generally. The elastic limit is rather more than twice as high; consequently while the derricks may be used safely under the regular working loads for repeated steady stresses, they will withstand safely infrequent stresses of much larger amount. All the stresses have been taken care of within the structure itself. Bases have been put at the proper places and no guy lines or other extraneous means of support are necessary. Neither are any buttresses now used, such as were thought necessary with the steel derricks made years ago. When the derricks are firmly bolted to the base, they will withstand extremely high winds and the chances are that should they blow over, they will blow over in one piece. Gusset plates, diagonal braces and other small members have a minimum thickness of ¼ in.; no material of less thickness than ¼ in. is used except for fillers. The thickness of angles and plates used for braces and for details of the machinery supports is ⅜ in., except where increased thickness is necessary to provide proper bearing for the shafts.

The theoretical safe loads which these derricks will sustain vary, of course, with their size and hight. The 55-ft. Woodworth-Oklahoma will carry 56,000 lb. safely, while the 80-ft. standard will carry 90,000 lb. A number of derricks and drilling rigs have been already placed in active operation, a sufficient number to justify drawing conclusions as to their advantages, based not on theoretical considerations, but on actual experience.

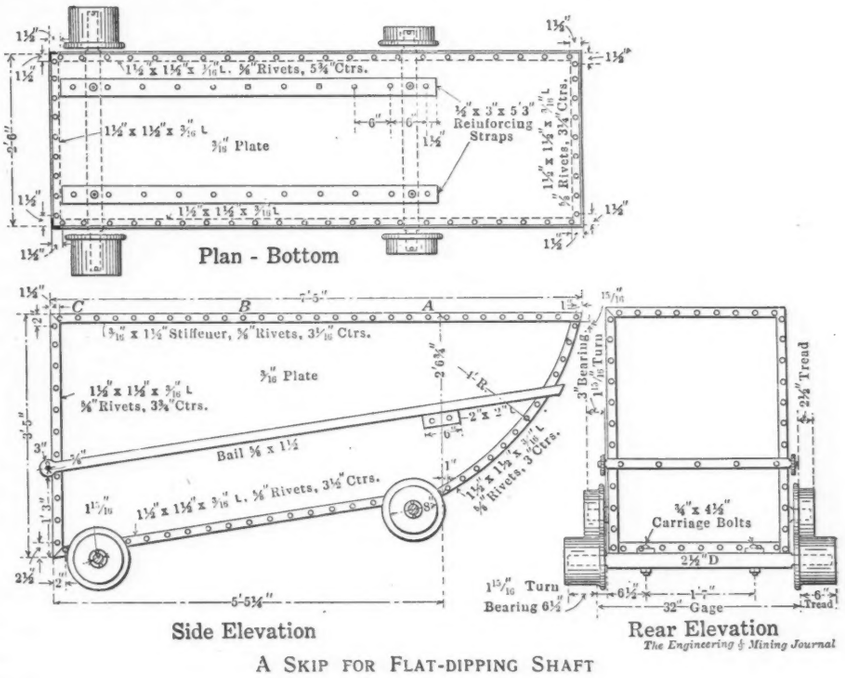
The first cost of a steel derrick or drilling rig may be much higher than that of a wooden derrick or drilling rig, but it represents an investment of indefinite use and practical indestructibility. Assuming that a wooden rig would be used to drill two wells and that a steel rig may only be used to drill four or five, then even on this low basis, capitalized at the usual rate of interest, the investment in a steel drilling rig will yield larger returns by reason of its small cost of maintenance and its durability. As a matter of fact, some of the steel rigs have drilled six wells apiece, ranging from 2200 to 3800 ft. deep, and are just as good as the day they were built.

The objections which have been raised against the use of the steel derricks are theoretical and have all been met in actual experience. It is natural that the rig builder should prefer wood, but valid objections should be based on considerations other than those of individual preference. Dawson, in his pamphlet on well-drilling methods, calls attention to two criticisms against the steel derrick, which he considers valid; first, the delay and expense in getting repairs from the supply houses for parts that may be bent or broken, and, second, in the use of bolts. Neither of these objections are truly valid. The first objection is not valid for the reason that steel is not likely to be broken by any possible calamity that may happen to it, and if bent, it is easily straightened at the driller's own forge. Moreover, so far as the types of derricks discussed in this paper are concerned, they are carried in stock and any piece may be obtained as quickly as almost any other part of the drilling rig. Mr. Woodworth states that in the nine years in which he has been connected with this industry, he has never had to replace a part for either of the reasons stated.

So far as the use of bolts is concerned, the drillers were afraid that they would work loose and drop on their heads while operating, and therefore Mr. Dawson suggested the use of jamb-nuts. Other people have suggested the use of square-shouldered or elliptical bolts with lock nuts, and again others have suggested that a cotter pin be used in each bolt. Mr. Woodworth says: "In my own experience there has never been a bolt which came loose in the drilling rig under the ordinary operations of drilling, and I am firmly persuaded that the ordinary round machine bolt with a carefully cut thread is all that is necessary. The future of the steel derrick seems well assured and the utmost economy in the drilling of wells for gas, at least by the cable system, will be found in the use of the structural-steel rig, rigid and steady when erected and easily dismantled and reërected by the use of bolts and, therefore, made both permanent and portable."

Automatic Skip for Inclined Shafts

The accompanying illustration shows the details of a 48-cu.ft., open-top skip designed for and used by the Salt Lake Copper Company at its mine at Tecoma, Nev., in a shaft, inclined at a low angle from the horizontal.



A SKIP FOR FLAT-DIPPING SHAFT

The design presents several novel features, such as a curved bottom at the front for directing the ore when the skip is in discharging position and attachment of the bail at the lower end or back of the body of the skip.

In operating, the rear wheels pass up a secondary track in the shaft headframe, which causes the skip to assume a nearly vertical position with the rear wheels above the shaft rails. The rear wheels drop back upon the shaft rails by gravity when the hoist is reversed.

Owing to the cost of upkeep of wooden launders, several of the Broken Hill plants are now using steel. An idea adopted at Waihi is worthy of note. The launders, according to the *Aust. Min. and Eng. Rev.*, are made of wood and lined with old belting.

Land Laws and the Mining Industry

By George Otis Smith *

Leasing system and separation of surface and mineral rights favored. The apex law, location without discovery, and development of idle claims discussed. Larger areas should be permitted in coal land grants. New laws imperative for oil and phosphate lands.

NOTE—An address delivered at the twenty-first anniversary of the Michigan School of Mines, Houghton, Mich., Aug. 9, 1911.

*Director of U. S. Geological Survey, Washington, D. C.

The increasing share which the U. S. Geological Survey has been asked to take in the public-land administration by the Interior Department has brought many of the problems connected with the public-land laws more directly to the attention of those charged with the work of this bureau. For over 30 years, however, these problems have interested the Survey geologists, who have had exceptional opportunities for first-hand observation in nearly all the important mining districts of the country, and for almost as long a period the engineers of the Survey have been in touch with the irrigation and power developments in the public-land States. This intimate experience with both field conditions and administrative problems justifies an expression of opinion which may be appropriate to this occasion.

The objects to be sought by amendment of the public-land laws are: (1) Purposeful and economical development of resources for which there is present demand with retention of such control as may insure against unnecessary waste or excessive charges to the consumer; (2), the reservation of title in the people of all resources the utilization of which is conjectural, or the need of which at least is not immediate.

Separation of Mineral and Surface Rights

The means that are essential to the attainment of these objects are: (1) The classification of the public lands; (2) the separation of surface and mineral rights; (3) the disposition of the lands on terms that will secure the highest use, enforce development and protect the public interest. Legislation based on these principles will not only secure the positive benefits of immediate utilization, but will also avoid the evils of speculative holdings of lands by fictitious use or by admitted nonuse, for the future enjoyment of the unearned increment or of the profits of monopolization. With actual development made a condition of possession, and with land classification and separation of estates made preliminaries of disposition, the present-day utilization by individuals or corporations and the reservation to the people for future use become at once possible without conflict of interests.

The classification of the public land is essential to the administration of not only such laws as express the principle of separation, but also of those whose purpose is to promote the highest use of the land. Land classification is first of all the determination of the best use to which each particular portion of the public domain can be put, and by the organic act of March 3, 1879, this duty was specifically imposed upon the director of the Geological Survey. Under the withdrawal act of June 25, 1910, classification is made possible in advance of disposition and disposition can be postponed to await needed legislation.

The second step, both in principle and practice, appears to be that of making possible by legislation the separation of surface and mineral rights whenever the two estates have values which can be separately utilized. A notable advance in public-land legislation was the passage of the acts of March 3, 1909, and June 22, 1910, which provide that patents issued thereunder grant title to the surface of the land only, and thus permit the agricultural development, while at the same time the United States retains title to the underlying coal deposits.

Water-power Leases

On the subject of water-power legislation the position of the Geological Survey is essentially that set forth in January of this year in a report addressed to the Secretaries of the Interior and of Agriculture by a joint committee representing the two Departments. The legislation there outlined would provide for lease of public and reserved lands of the United States valuable for water-power development for a fixed term, not to exceed 50 years, with moderate charges for use and occupancy of the land, and revocable only upon breach of conditions or on account of the charge of excessive rates to consumers. These leases should be identical in terms, whatever the Department under which they are granted, with joint and uniform regulations governing all matters relating to water-power development of land belonging to the United States. Provision should also be made for periodic and equitable readjustment of charges, transfer of leases, preferential rights to renewal, and compensation for improvements at the termination of the leasehold. The law should specifically recognize water-power use as dominant and both insure to the lessee undisturbed occupancy of the land needed for such use and reserve for future utilization all the land believed to possess value for water-power development, these lands to be designated by the President, but to be open to other entry subject to this reserved right wherever separation of the water-power use and other use is possible.

The chief advantage of land withdrawal and classification lies in the essential relation to the principle of proper disposition of the public domain, the real purpose of public-land administration being to secure such reservation or disposal of the people's land as will assure its highest use. The question of amendment of the present laws relating to the disposition of coal, oil, gas and phosphate deposits on the public domain is recognized as fairly before the public by the specific mention of these minerals in the withdrawal act.

Lease System Best for Coal Land

The coal-land law is unquestionably the most satisfactory of the present mineral-land laws in that it admits of the placing of an adequate valuation upon the deposits, and in the administration of this law the purpose is not only to base the appraisal price upon the quantity and quality of the coal present and to give consideration to every known physical and commercial factor affecting the value of the deposits, but also to make the selling price approach as nearly as possible the present purchase of a royalty under a leasehold. Thereby it is intended to permit purchase for immediate development and at the same time to prevent or at least discourage purchase for long-time investment or for monopolization.

So many factors, however, require consideration that an ideal adjustment of the values is well nigh unattainable for many, if not for most coal lands, and on this account a strong argument may be made for support of the lease over the sale system. Under leasehold it would be comparatively easy so to adjust the relationship between ground rental and royalty as to prevent the acquisition of coal deposits until such time as their development should be profitable. On the other hand, it is possible, under the present law, and it is the policy in its administration, to readjust the prices from time to time, either by reduction to encourage development in special cases or, more commonly, by raising the price on account of increased value due to new discover-

ies or to changed commercial conditions. Hardly less important, moreover, is the better control possible under a lease system, although against the advantage of such control must be weighed the cost of Federal management and the possibilities of inefficient administration or even maladministration.

Coal Areas Too Restricted

The present coal-land law, however, has one serious defect, which should be remedied if a leasing law is not enacted. The restriction of area that may legally be acquired to a maximum of 160 acres for an individual and 640 acres for an association is not in accord with good mining practice. The fixed charges on the cost of a modern coal mine, provided with the uptodate equipment necessary to conserve life and property and to assure maximum recovery are too high to be assessed against the tonnage of so limited a tract, especially if the coal seam is of moderate thickness. A law designed to promote the practical utilization of coal deposits, whether the system contemplates sale or lease, must provide for the holding of a large enough unit to permit the opening and equipment of a modern mine and to warrant its operation on an economical scale. Without such provision for commercial operation too great an advantage is secured to the land-grant railroads and large coal companies already in possesssion of considerable areas of high-grade coal.

The present uncertainty whether the phosphate rock of the public land should be entered under the lode law or under the placer law is conclusive evidence of the need of legislation. As a matter of fact neither of these laws is more applicable to the acquisition of beds of phosphate-bearing limestone than it would be to that of coal beds. The realization that the phosphate deposits are more extensive than was known or suspected when the Survey geologists began land-classification work in Idaho and Wyoming does not lessen but rather increases the urgency for a leasing law, which will provide for the utilization of this large supply of mineral fertilizer, so as to meet both present and future needs.

Placer Law Inadequate for Oil

The most urgent need of legislation for the disposition of mineral deposits is in the case of oil and gas. It is most apparent that the placer law, which is none too well adapted to meet modern conditions in mining placer gold, is wholly inadequate as a method of dealing with public oil lands, inasmuch as the discovery of oil is a late stage in the exploration and development of the land claimed under the law. Thus, large expenditures, extending over several months, if not years, are necessary before any right is acquired against the Government, and during all this time there is lacking any legal protection of the oil prospector against any unscrupulous claimants or competitors better backed by capital. The need for remedial oil legislation is somewhat less acute than it was a year ago, by reason of the passage of the act approved March 2, 1911, the effect of which is to validate a class of claims which, while clouded by the construction which the Department was forced to place upon the misfit placer law, under which title to oil lands must now be made, were *bona fide* in that the inception of their development antedated the oil-land withdrawals. The enactment was in accord with the spirit of the withdrawal act, which provides for the protection of equities already established.

The need for a better law is, however, imperative, and the legislative action demanded by the situation should not be limited to an attempt to revamp the general placer law but should be the enactment of an altogether new measure, especially adapted to provide for the sane and equitable development of this industry in the future. First, the new law should authorize the issue of exploratory permits, granting to individuals or associations the exclusive privilege of occupation, the sole condition of such a grant being diligent and adequate prosecution of development work, measured by the expenditure of fixed sums within certain periods, with possibly the payment of a small fee to the Government in lieu of such expenditure during the first six months. The issue of this permit should preferably be limited to one to each citizen or association of citizens, although after the lapse or surrender of such a permit the former holder should be allowed to again apply for an exploratory permit. In the second place, the law should provide that upon discovery, the holder of the permit be given a leasehold title, with a royalty varied to meet local and actual conditions. The "wildcatter," or prospector in unproved country, whether such unproved territory is classified on geological evidence as oil land or not, should be given special privilege to offset his greater risk. This privilege might take the form of an increased acreage, held both under permit and under lease, or a practical exemption from the payment of royalty, merely a nominal rental being charged under the lease.

Preventing Land Grabbing

The chief advantage of the leasehold for oil over a fee-simple title lies in the prevention of monopolization through large holdings. Such large holdings without production would be guarded against by a ground rental sufficiently high to discourage the acquisition of lands except for immediate and continued development, although provision should also be made in the lease for surrender under terms which would protect the Government. This indirect control of development would be preferable to the direct enforcement, by forfeiture, of continuous production, which should be avoided because of the danger of disturbing the delicate equilibrium between supply and demand. Transfers of interest, under either permit or lease, should be permitted because of the absolute necessity in most instances of securing capital for both drilling and operating an oil well. The law, however, should set forth the purpose of such control of transfer, which would be to provide protection for the original locators, most of them men of small means, and more especially to secure the prohibition of too large holdings of Government leases by big companies.

Metal Mining Laws

Proposed amendments of the well established laws relating to metalliferous minerals always raise the warmest discussion. With the opinion of mining men in general favoring revision of the mining laws of the United States and with commission after commission appointed by various bodies to suggest improvements, the statutes have remained practically unchanged for nearly 40 years, while the geology of ore deposits and the technology of metal mining have made marvelous progress.

The law of the apex has proved more productive of expensive litigation than of economical mining. In many of the more recently established and more progressive mining districts this statute has been made inoperative by either common agreement or compromise between adjoining owners. Its repeal could not affect established equities under patents already granted but would render possible more certain property rights in large mining districts as yet undiscovered, where new and valuable claims will be located 100 years from now. The unit of disposition should be the claim, preferably square, limited on its four sides by vertical planes, and of a size sufficient to allow the miner occupying two contiguous claims to follow the vein or lode to considerable depth, even if its dip is only 45 deg. Such definition of a mining claim is found practicable in both Mexico and British Columbia, and in the latter country the change from the apex law was effected without trouble or confusion.

Locations without Discovery

The same knowledge of natural conditions that leads to the suggestion of a repeal of the law of the apex forces the further suggestion that discovery of ore in place cannot be made universally a prerequisite to the location of a mining claim. Geologic study of ore deposits has furnished examples in a number of regions where the present law cannot be complied with, although rich deposits exist underground and their extent can

be more definitely surmised than in most cases where ore is discovered at the surface. To meet such actual conditions the law should provide for the acquisition of metalliferous mineral land classified as such upon the basis of adequate geologic evidence, whether actual outcrops are present or not.

Most important, perhaps, in any amended mining law, would be provision for enforced development, a principle expressed, it is true, in the present law but not effective in its workings. A requirement of actual use as a condition of occupancy of mineral land cannot be regarded as either novel or radical. As regards the large acreage of undeveloped land in many mining camps to which patent has already been issued, it is perhaps true that the situation is without relief, unless the Western Australia plan is adopted, whereby the Government steps in and permits mining under a lease, the proceeds of which are assessed, collected, and paid over to the owner. The principle invoked seems to be that no property owner can rightfully oppose the development of the state.

Forcing Development of Claims

In the case of unpatented claims a remedy should be sought for what has been termed "the paralysis of mining districts," and the rigid requirements of annual assessment work should be made actual and effective by inspection and supervision, in order to put an end to the present procedure of allowing a claim to lie idle for practically two years after its location, not to mention the many localities where claims are held year after year with only perfunctory compliance, or even without any performance of assessment work—a type of local disregard for law that is in striking contrast to the observations accorded to the district customs and regulations of earlier days, whereby the right of possession was made absolutely dependent upon continuous operation.

The remedy, then, for the existing evil of idle mining property must be sought either in the adoption of leasehold, under which the Government can enforce operation, a system which fully attains the desired end of promoting mining development in Australia and New Zealand according to the report made to the President in 1907 by Geologist Veatch of this Survey, or in the thorough revision of the existing system. Radical amendment to the present law would be necessary in order to secure something more nearly approaching equality of opportunity. Some limitation should be put on the number of claims which an individual can locate in each mining district, and the prevention of monopolization would be furthered by the rigid enforcement of assessment development. The record of claims kept by a local official elected by the miners should be reported promptly to the nearest land office in order to furnish the Federal Government with a notice of the intention of the claimant, and thus to initiate the operation of effective inspection, the purpose of which would be to enforce the use and development of mineral land as contemplated in the law.

Whatever the details that may characterize this or that amendment to the public-land laws, the essentials to be sought are development of those resources for which there is present need and the protection of the other resources for which there is no immediate demand. To this end the lawmakers in my opinion should concern themselves more in retaining such control as will prevent either nonuse on the one hand or waste on the other, than in devising means of increasing the public land receipts by heavy royalties on the producing coal mine or hydroelectric plant. Tax instead the idle property. Through the full development of the mineral industry, the nation can secure indirect benefits far in excess of any direct profits in the form of fees or royalties.

Electricity in Mining

Washington Correspondence

The Bureau of Mines has sent out announcements calling attention to the work of the electrical section of the Bureau and inviting suggestions with regard to it. It notes that electricity is largely used in mines and that a distinct branch of electrical engineering has been developed in connection with the mine equipment. The object of the electrical section is to study the problem of safeguarding life and property from the dangers connected with the use of electricity.

Electric haulage is operated principally from trolley wires without insulation and often near the heads of operatives. Underground equipment is exposed to falls of roof, injury from acid waters, and general dampness. The bureau finds that the three chief dangers arising from the use of electrical equipment in mines are those of electric shock, and explosions and fires caused by electricity. Many mine operators would install safer electrical equipment if the market supplied it, and the manufacturers will develop special equipment as fast as they see a field for its use. The bureau has made a few preliminary investigations, the most important of which are the inquiry as to the danger of gas ignition by the blowing out of inclosed fuses, and an investigation as to the danger of gas ignition by incandescent lamps when broken in gaseous atmospheres. It has shown that certain sizes of incandescent lamps when broken ignite surrounding explosive mixtures of gas and air. In addition to making these lamp tests, the bureau is investigating explosion-proof motors and switches and the action of mine water upon the insulation of conductors. The action of electric sparks and arcs in coal dust has not yet been fully taken up but shortly will be, while among other investigations will be one relating to the danger of using electricity in the vicinity of explosives, an investigation of electrical shot firing and the study of devices for the protection of the trolley wire. As a result of tests made on fuses it was found that there were two dangers attending the action of such fuses in the presence of inflammable mixtures of gas and air, namely: (a) The indicators situated on the external surface of the shell may, by giving out sparks or otherwise, ignite the explosive mixture. (b) The blowing of hot gas and jets of flame through the relief ports of the fuses.

The conclusions obtained from the results of these tests are as follows: (1) One or more sizes of all the brands of fuses tested ignited gas, although in varying degrees. Two brands ignited the gas but once; three brands ignited it in more than 50 per cent. of the trials. (2) The principal source of danger in fuses as they are now designed is the device for indicating whether or not a fuse has acted. (3) Danger from blowing at the relief ports will probably develop in some and possibly in all brands if tested with enough generating capacity.

Platinum in British Columbia

Special Correspondence

Some reports have recently been circulated to the effect that a company, organized for the purpose, has obtained leases from the government on about 20 miles of the Similkameen and Tulameen rivers, and that a campaign of thorough drilling has been conducted, terminating in satisfactory results. It was also stated that about 40 drill holes were sunk and that in addition to indicating the presence of platinum, it was disclosed that bedrock is deeper than was generally supposed, probably averaging about 12 ft. The fact that the ground is auriferous is believed to be a matter of common knowledge, but apparently the presence of platinum occasioned some surprise.

It has been intimated that the method of recovering platinum will be through dredging. In this connection, there seems to be some question as to the probable success of dredging operations in this field, either for gold or platinum. It has been observed that the alluvial soil seems to be too full of large boulders to promise any success in dredging. Whether or not this can be proved in any way other than by actual operations remains to be seen.

The Steel Corporation Investigation

Charles M. Schwab's history of the formation of the Steel Corporation. Details of the Carnegie purchase. The question of prices.

The genial Mr. Schwab was an entertaining and instructive witness before the Stanley committee. This is his version of the inception of the United States Steel Corporation:

"I am very glad of the opportunity to tell once and for all the definite story about which there have been so many misrepresentations and misstatements, and I will do so, with such detail as I can remember at this time. In the fall of 1899, and while I was president of the Carnegie Steel Company, J. Edgar Simmons, a banker, of New York, and Charles Stewart Smith, also an important business man of New York, and particular friends of mine, tendered me a dinner at the University Club, and invited to that dinner some 70 or 80 of New York's most distinguished financiers and business men.

The Centralization Idea

"I was very much flattered and honored at this dinner, and had the pleasure of making some remarks that evening for the company, and chose as my subject my idea of the future development of manufacture in the United States, especially as relating to our industries, and, while I expected to occupy but a few moments, the matter was of such great interest to the gentlemen that much time was taken. I explained at that meeting the very great advantages that would result in manufacture from such an organization as the United States Steel Corporation, and I gave my reasons in detail to them. First of all, that, instead of manufacturing steel by a number of companies, each of whom manufactured the same lines, it was my idea that the organization, to be truly successful, and to control the business of the world—I mean, to have prominence in the business of the world—should be made of such a character that one mill could be run on one product, and not one mill on 50 products, as was then the practice.

"I paid particular attention at that time to state that my idea of this great organization was not with a view of establishing any arrangement with reference to the limitation of production, or the increase or maintenance of prices, but that the economies resulting from these things would be so great as to make capital invested in any of the individual enterprises much more profitable."

Mr. Schwab said that J. P. Morgan, who sat at his right hand, was so impressed that a few days later the great financier sent for him through the medium of John W. Gates, and immediately began the work of organizing the United States Steel Corporation. Mr. Morgan asked him to get Andrew Carnegie to name a price on his plant.

"I did," said Mr. Schwab. "I reminded Mr. Carnegie of his age, and his desires in life—which were mostly philanthropic."

Mr. Carnegie, he said, reluctantly agreed to name the price and later regretted it. Mr. Schwab said that beyond advising Mr. Morgan he had had nothing to do with the formation of the United States Steel Corporation.

Fixing Prices

Mr. Schwab said that the methods of Carnegie in the early days, when, by capitalizing with men rather than with money, he was able to smash all agreements between his competitors, stir up competition, and make, in the words of Stanley, "the Carnegie company a bull in a china shop," were no longer possible, because of the high state of perfection of the art and the accomplishment of practically all the advancement that can be made in practice.

"The most expensive men that money could buy could not reduce the cost of production of rails a dollar a ton, today, even with unlimited capital," said Mr. Schwab.

In response to Martin W. Littleton's questions, Schwab said that there was a certain natural fixing of prices on steel products, as, for instance, $28 a ton for rails.

"Who fixed this price of $28?" was asked.

Mr. Schwab admitted frankly that it probably had been fixed by agreement 12 or 15 years ago, and maintained by usage.

He also admitted that if the trust should reduce this price to $22, all the others would have to follow suit. He said that the consolidation which he had described would benefit the industry and the manufacturer, but that there would be no effect on the consumer. Everything, he said, when analyzed to finality, came down to labor, and the consumer benefited by the better conditions of the industry, and thus a circle was formed.

When asked about labor conditions in the steel business, Mr. Schwab said the 18,000 to 20,000 men employed by the Bethlehem works received an average of $1000 a year. This was exclusive of salaried men, and applied to wage earners.

Comparing Costs

At the recent convention in Brussels, continued Mr. Schwab, he had suggested that the independents compare their details of cost and frankly interchange them. This he said, to the astonishment of the committee, was now done, except as to what was known as "conversion cost." It was his desire that this item too should be included.

The chairman then asked if he proposed that the various independent companies should compare their costs, and Mr. Schwab said that was his intention. That each one of those companies should give to each of the other companies an itemized, accurate, and detailed statement of the cost of the production of its articles. He proposed to extend it still further, and to compare all the items that go into the cost of making a ton of pig iron, for example, at the various independent plants throughout the United States.

In answer to a question from the committee whether he would furnish a cost sheet showing the operation of one of the great blast furnaces, the constituent elements of iron that go into it, the actual cost of every detail, of mining, transportation and smelting, from the time that the first raw material was taken from the bowels of the earth until the slag was in one place, and the iron in another, Mr. Schwab said that he was not only willing to do it, but had done it. He also said that the Steel Corporation furnished such statements to him, though he was connected with an independent company. The policy of concealment, which had been the rule up to a few years ago, had been dropped.

Export Business

Mr. Schwab described how the export business had been developed by the Steel Corporation. Personally he believed it good policy to sell the surplus production at cost. As to the question of foreign competition, he said that it all resolved itself into a question of labor costs, as he had before explained. In Germany, for instance, their labor and transportation costs were lower than in this country, but this was largely balanced by the use of better machinery. At the present time German mills were able to sell rails on the Pacific Coast, owing to the low cost of water transportation there.

Price Agreements

Mr. Schwab was rather severe on price agreements in the past. He had known of several "gentlemen's agreements," some of which had lasted a few months; while others lasted only "as long as it would take a man to get to a telephone." In one case, he believed, a penalty of $100,000 was agreed on for violation of

the agreement; but, he added, he would not let that penalty stand in the way of a big order, and others were apparently of the same mind. Incidentally he denied that anything had been said at the recent international conference in Brussels in relation to fixing prices.

By selling at a certain level the Steel Corporation could prevent prices from rising above that point; or by reducing prices it could compel others to reduce also. It could not, however, maintain a high price, or any price, if others wished to sell at lower rates.

The advantages of combination, he repeated, were in the improvement of methods and in a better division and distribution of work. In this way costs—especially transportation costs—could be reduced. In these statements he simply gave his own views and did not advance any new arguments.

MR. ROOSEVELT'S STATEMENT

On Aug. 5, Ex-President Roosevelt appeared voluntarily before the committee and made a statement as to his action in the matter of the purchase of the Tennessee Coal, Iron and Railroad Company by the Steel Corporation. His statement, however, did not add anything to what has been known concerning that transaction, simply giving his reasons for approving it at the time.

Mogul Mining Company

DEADWOOD CORRESPONDENCE

According to the annual report of the Mogul Mining Company, covering the fiscal year ended March 31, 1911, the bullion production for that period was $376,121, recovered from 114,873 tons of ore of a value of $4.239 per ton, of which 76.5 per cent. of the gold and 35 per cent. of the silver were saved. John V. N. Dorr, consulting engineer, in his report states that with the tube mill, which is now in operation, it is expected that the recovery will be improved during the present year.

Mr. Dorr states that the milling costs for the year were $1.1026 per ton, a rather high figure, owing in part to the extra labor required and more particularly to the lack of skilled labor when milling was resumed, during the early part of the year, with a nonunion force. The normal treatment expense is under a dollar per ton. The mine is in excellent condition, and General Manager McLaughlin says that there is probably more ore, and of a better grade, in sight in the mine than ever before. The Farm produced 31,484 tons, the Lucille 24,256 and the Hardscrabble 23,807. At the beginning of the fiscal year the mine was shut down on account of labor trouble, and it was August before operations were on a smooth working basis.

List of Dead and Missing in Porcupine Fire

The following list of dead and missing, as a result of the Porcupine fire, was compiled by the Relief Committee appointed immediately after the disaster. Because of haste and confusion necessarily following such a disaster, it is quite probable that there are some inaccuracies, but it is published herewith on account of its being the best information available at this time.

DEATH LIST

Jules Metayer (Le Bretton); buried northeast side of lake.

Andre Le Roux, Montreal; buried at Edwards point.

Orpila Mondoux, Cobalt; age, 50; body recovered.

Charles E. Adams, Phœnixville, Penn.; age, 21; body shipped.

William Taylor, Reading, England; relatives advised; buried at Pearl lake.

R. A. Dwyer, Butte, Mont.; relatives advised; found and buried on United Porcupine Gold Mines property.

Joseph Flynn, Bracebridge, Ontario; found and buried on United Porcupine Gold Mines property.

Andy Youill, Toronto, superintendent; found and buried on United Porcupine Gold Mines property.

Joseph Fletcher, Cockermouth, England; found and buried on United Porcupine Gold Mines property.

One unidentified, found and buried on United Porcupine Gold Mines property.

Patrick Dwyer.

William Moore, Cobalt; age, 35; body shipped.

Melvin Strain, Porcupine; body recovered.

Nathan Haas, Spokane, Wash.; relatives in Houghton, Mich., notified; body shipped.

Stanley Nicholson, Guelph; age, 28; body shipped.

William Gore, Porcupine; age, 43; buried in Porcupine.

T. R. Geddes; age, 54; buried on Foley-O'Brien property.

Mack Smith, New Liskeard; relatives advised; buried on Foley-O'Brien property.

Thomas Bodin (man of same name is living), buried on Foley-O'Brien property.

Captain Thomas Dunbar; Kennedy & Dunbar, Pembroke; buried on Foley-O'Brien property.

Harry Hardy, Bath, England; assayer, Dome mine; buried at Dome property.

Fritz Manse, Melbourne, Australia; age, 18; buried at Dome property.

John Whatmaugh, Toronto, student; age, 22; buried at Dome property.

Thomas John King, Copper Cliff, Ont.; age, 55; buried at Dome property.

Charles Jackson, colored, Pittsburg, Penn.; buried at Dome property.

Archie Johnson, Sudbury, Ont.; buried at Dome property.

Leo H. Sulman, London, England; assayer, Dome mine; body shipped.

Stanley Fitzmaage, Melbourne; age, 27; buried at Dome property.

Arta Alhod, Kelso, Ont.; died in transit.

Didelo Diepro; worked at Dome mine; died in Liskeard hospital.

Robert Weiss, Butte, Mont.; age, 60; died at West Dome property.

Child of Robert Weiss; West Dome.

Mrs. Robert Weiss; West Dome.

James Rennie, Edinburgh, Scotland; died at West Dome.

R. J. Welch, Cache Bay, Ont.; died at West Dome.

John McLaughlin, Venisoti, Ont.; died at West Dome; body shipped.

William King, Los Angeles, Cal.; died at West Dome.

Angus McDonald, Turner street, Ottawa, Ont.; died at West Dome.

A. E. Burt and wife, Cobalt, Ont.; died at West Dome.

John Destern, Toronto, student; died at West Dome.

D. M. Macqueen and wife, Kippen, Scotland; died at West Dome.

John Wall; died at West Dome.

Harry Brookins; died at West Dome.

John Saunch; died at West Dome.

Hugh McLeod, Glencoe Mills, Cape Breton; died at West Dome.

Lester Henninger; died at West Dome.

J. W. Cranshaw, Phœnix, Ariz.; died at West Dome.

William McLean; died at West Dome.

J. Paulin, Montcerf, Ont.; died at West Dome.

Unidentified man; died at West Dome.

J. Orr; died at West Dome.

W. Beeita; died at West Dome.

A. J. Ryan; died at West Dome; T. A. Dobbins, Manhattan Drilling Company, 50 Church street, New York; notified.

Victor Puera; died at West Dome.

E. Sherrien, Ottawa, Ont.; died in transit.

Hugh Meehan, Sudbury; brother at Sudbury notified.

John McDonald, Eaginville; wife notified.

Michael Johnson, found on Trout creek, Nighthawk district; supposed to have committed suicide.

Marshall Morrison, Haileybury, Ont.; found at corner Tisdale, Whitney, Shaw and Deloro townships.

Fred Herbert, England; found at corner Tisdale, Whitney, Shaw and Deloro townships.

Edward Cullen, 2021 Broadway, New York; died on Eagan claims.

Ormond (Oscar) Butler, Tangier; died in southeastern part of Shaw township.

Thomas Cooper; died at New Liskeard.

John Bowers; died at New Liskeard.

Pretro Depaoli; died at Copper Cliff, Ont.

John Bilo; died at New Liskeard, Ont.

Arthur Hale; died at Copper Cliff, Ont.

Reported Missing

The following are reported missing, but this does not mean that they are necessarily dead or even injured; owing to the confusion at the time of the fire and for several days following, it was an easy matter for one to leave the camp unnoticed and there is no doubt but that many left in just this manner. It is practically impossible to trace these individual cases.

Following the name is given, (1), the supposed working place; (2), other information when available.

George Snowden Andrews; Pigeon rapids, Mattagami.

Malcom Black; Kamescotia.

William Black; Kamescotia.

Frank Byron.

Harry Bruce.

Desire Bourdon.

——— Barrette.

Thomas Bascom; Bristol township.

Samuel Brown; Rowe claims, Langmuir township.

Herbert Bentley; Price township.

Roy Brady and companion; probably camping on claim 3103—P, Shaw township; from Toronto.

Fred Bidgood; advise John Bidgood, King Edward hotel, Sudbury, Ontario.

J. Coyne; Powell claims, Deloro township.

T. Condil; from Haileybury.

Thomas Croon; Rowe claims, Langmuir township.

Fred Clarke; from Brockville.

Russel Dale.

Harry Darce or Dance; working for Martin Vair.

John S. Dekker; Cripple Creek township; from Porcupine.

Joradius Darling; telegram, Merrill.

—— Dalby; South Langmuir township.

A. W. Dexter; Powell claims, Deloro township; from Folkestone, Kent, England.

William O'Flynn.

Flanerty Crawford; West Dome.

C. S. Feslier; from Butte, Mont.

T. Gravelle; Whitesides-Cripple Creek.

Howard Genchon; wire car inspector, Canadian Pacific railroad, Alex Mac.

Henry Robert, Pearl lake.

T. W. C. Hutchins; with Fred Hamilton in Cripple Creek township.

Fred Hamilton; Cripple Creek township.

Sylvia Hortell; from Sudbury, Ont.

O. Jelly.

Samuel Jeveraux; Cripple Creek township; from Cobalt.

James Lefranier; from Quebec.

—— Lacroix; from Haileybury.

Morris Mofft.

O. Morrison.

William Mogridge.

Arthur Motye.

John Murray.

John McKay; Deloro township; from Cobalt.

Thomas McLeod; Rowe claims, Langmuir township.

A. Seircy McDonald; from Port Hawkesbury.

J. Moss; from Reno, Nev.

—— Murray; South Porcupine.

Hugh O'Donnell; Bristol township.

Michael O'Neill; carpenter, Foley-O'Brien mine; was with A. J. Ryan.

Oscar Patrice; from Haileybury, Ont.

George Payette; advise E. Payette, Haileybury, Ont.

James Sweeney.

Andrew Quesnel; from Sudbury, Ont.

Dennis Roberts; Langmuir and Carman townships; from Newfoundland.

Timothy Robinson.

A. W. Ross; Bristol township.

Scotty Robb; Bristol township.

Charlie Ross; Bristol and Cripple Creek townships.

Eric Ryerson.

J. J. Shea; Eldorado township.

Edward Sinclair; Cripple Creek township; from Sault Ste. Marie, Mich.

William Thackeray.

William Anthony Thompson.

C. Villeyea.

Charles Villagracia; Powell claims, Deloro township.

Another Slide Feared at Frank, B. C.

By E. Jacobs*

R. W. Brock, director of the Geological Survey of Canada, expresses the opinion[1] that it does not appear safe to continue mining coal from seams near the base of Turtle mountain, which overlooks the town of Frank, in southwest Alberta, Canada. He says that since the great landslide at Frank in 1903 the Survey has kept Turtle mountain under inspection, as the northwest shoulder overlooks the town in a threatening manner. Upon visiting Frank on Oct. 12, 1910, he found the northwest shoulder to be in a more dangerous condition than it was in 1909. Previous to 1909 it exhibited no signs of movement nor, apart from its structure, of any weakness, but in that year, two small cracks were detected, so slight, however, that their existence might be questiond.

Cracks Again Appearing

They are now quite marked, and the cracks between the shoulder and the peak show development. In most cases the block severed by a crack is not large enough to cause damage, but as the joint planes along which the cracks form dip towards the face of the cliff, only those near the face can open, the weight of the inverted wedge tending to keep the joint closed. Moreover, the surface is covered with shingle so that only a gaping crack makes itself visible, hence a dangerous break back from the face of the cliff along which an enormous slide might take place, might not be detectable on the surface even at the time a slide was about to occur.

The cracks on the north shoulder are significant as indicating that movement has taken place and that the solidity of this huge mass of rock is not to be relied upon. The recent movements indicated by these cracks may well be ascribed to the disturbing effects of mining operations. In view of what has already occurred, of the present condition of Turtle mountain, and of the damage to property and life that would result in case the northwest peak and shoulder fell, it does not appear safe to take further liberties with this mountain and in his opinion the coal seams near its base should not be disturbed.

The 1903 Rock Slide

The rock slide of 1903 was described[2] by Walton E. Dowlen as follows: "On April 29, 1903, the center and highest peak of Turtle mountain fell away and shot down the mountain side, passing over the foothills which contain the coal measures. It spread out in broken fragments over the valley below so as to cover 7000 ft. of the Canadian Pacific Railway Company's track, with loss to life and property."

Turtle mountain is a narrow ridge of Carboniferous limestone that was forced up and through the overlying Cretaceous coal measures like a wedge, the thin end of which was crumbled and broken by disintegration, into three peaks, the highest and center one standing fully 500 ft. above the north peak on one side and the south peak on the other. A vertical section of the highest peak on an east-west line shows that the west slope is gentle while the east side, overlooking the town of Frank, the coal mine, and the railway, is precipitous. The base of this peak, from east to west is extremely narrow. This rock structure gives the east face a somewhat overhanging appearance with a block of the mountain behind it. The insufficiency of the base and the disintegration characteristic of limestone are given as the cause of the slide and that the mining operations had no relation to it. Mr. Dowlen contended that even if the Cretaceous rocks containing the coal seams were entirely removed, the limestone intrusion of Turtle mountain would be unaffected thereby.

Mr. Dowlen's opinion is given simply to show that, judgin from conditions as he saw them eight years ago, he did

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[1]*Summary Report*, Geological Survey, 1910.

[2]Eng. and Min. Journ., July 4, 1903.

not agree that mining operations caused the great slide of 1903, or would in the future occasion further disturbance of the mountain formation at a much greater altitude than that of the mine. It is noteworthy that no reference to the condition of Turtle mountain was made in the published official reports of the provincial inspector of mines in either 1908 or 1909 (that for 1910 has not yet been received). The Canadian-American Coal and Coke Co., Ltd., has been succeeded by the Canadian Coal Consolidated, Ltd., which has since been working the old mine and also what is known as the Shaft mine.

Lake Superior Mining Institute

The program for the 16th annual meeting of the Lake Superior Mining Institute, to be held on the Menominee range, Aug. 22 to 24, has been issued. On Tuesday, Aug. 22, members will assemble at Crystal Falls and register. In the afternoon visits will be paid to the Tobin, Bristol and Hollister mines, inspecting the new ore drier at the latter. In the evening a session will be held.

On Wednesday morning, Aug. 23, members will leave Crystal Falls in automobiles for the Iron River district, visiting the Chicagoan Lake, Swanson, Baltic, Caspian, James Davidson and other mines. At the Swanson, concrete shaft sinking will be seen. In the evening there will be a business session at Iron River and the election of officers.

On Thursday, Aug. 24, members will leave Iron River and go to Loretto; view changes in river course, and mining in the old river bed; then visit the hydroelectric plant at Sturgeon Falls, electric equipment and concrete-lined shaft at Vulcan. From Vulcan they will go to Norway and Iron Mountain, visiting Chapin mine, construction of dam at Twin Falls, and other points of interest. The meeting will close in the evening.

The following is a partial list of papers to be presented at the meeting:

"Accidents in the Transportation, Storage and Use of Explosives." By Charles S. Hurter, Duluth, Minn.

"Some Safety Devices of the Oliver Iron Mining Company." By Alexander M. Gow, Duluth, Minn.

"Tobin Mine Sub and Caving System." By Fred C. Roberts, Crystal Falls, Mich.

"Top Slicing and Caving System in Stambaugh District." By W. A. MacEachron, Iron River, Mich.

"Square Set Mining." By Floyd L. Burr, Vulcan, Mich.

"Check System of Time-keeping." By James D. Vivian, Crystal Falls, Mich.

"Boiler Setting and Coal Handling." By J. S. Jacka, Crystal Falls, Mich.

"Electrical Operating Plants of Penn Iron Mining Company." By Frank H. Armstrong, Vulcan, Mich.

"Social Surroundings of the Mine Employee." By Charles E. Lawrence, Iron Mountain, Mich.

"A Diamond Drill Core Section of the Mesabi Rocks—No. IV." By N. H. Winchell, Minneapolis, Minn.

"Block Caving on the Menominee Range." Author to be assigned.

"Surveying and Sampling Diamond Drill Holes." By Edwin E. White, Ishpeming, Mich.

"The Relation of Mining Interests to the Prevention of Forest Fires." By Thos. B. Wyman, secretary-forester, Munising, Mich.

Other papers are to be presented, the titles of which have not yet been announced, one being on the "Time-keeping System at the Newport Mine"; and a description of the "Salt Shaft at Detroit," by E. F. Bradt.

Cuyuna Range Notes

SPECIAL CORRESPONDENCE

On the south range of the Cuyuna district drilling activities have almost entirely ceased, there being but six drills operating on this range in Crow Wing county. The M. A. Hanna Company is sinking a lath shaft on its property in S. 10-T. 44-R. 31, about four miles southwest of Brainerd.

On the north range explorations continue with increased activity. About 45 drills are now operating, and reports of new discoveries are frequently heard. Township 46-R. 29 still contains a larger number of drills than any other township. These drills are busily engaged either in proving deposits already known, or in prospecting. A small exploration shaft is being sunk on S. 9-T. 46-R. 29. In T. 47-R. 29, the Iron Mountain Mining Company is sinking an exploration shaft on the Gorham-Garbett property in S. 33. At the Kennedy mine on S. 30-T. 47-R. 28, operations continue unabated, and it is said that the mine will be worked to its utmost capacity up to the close of navigation in 1912. Sinking, drifting and crosscutting continue at the four mines is S. 11-T. 46-R. 29, and it is expected that ore will soon be hoisted for stockpiling in this vicinity. In spite of encouraging discoveries made in S. 17 and 18-T. 46-R. 29, exploration west of the Mississippi river on the trend of this ore has met with little encouragement. There are a number of drills working on these outlying explorations, including five in Morrison county on the southwest extension of the south range and several in T. 136-R. 26, north of the Mississippi river.

From present indications there is reason to believe that drilling will continue actively for some time, as late developments seem to show that there is still a large area of favorable, unexplored territory.

Wire Man Gets Heavy Fine

Mention was made in the JOURNAL recently of the fact that a number of men prominently connected with the steel and copper-wire industry had been indicted for operating pools to control the prices of the various products. At that time the indicted men entered pleas of not guilty; since then, the majority have changed their pleas to that of *nolo contendere*, each receiving and paying a fine of $1000 on the first count and $100 on each succeeding count.

A notable exception in the amount of fines imposed was made in the case of Edwin E. Jackson, Jr. District Attorney Wise pleaded ably for a prison sentence in this instance, and his own words in requesting it, follow:

"He is the worst type of criminal that society can be damned with," said the district attorney, "for he has made his millions by dragging into the illegal pools that he has built up, men who were honorable and had no intention of doing an illegal act. Then when he found that his pools were going to be prosecuted, he went all over the country to get the men he had duped to come to his aid.

"He is not like many others who have been indicted, for he knew well that his practices were illegal. He is a lawyer. Then when the members of the pools became suspicious, he fooled them into believing that he had put the whole thing up to the Department of Justice and that it had been approved. It was he who originated the whole scheme for the wire pools and it was he who was responsible for the system of fines that were levied and collected.

"Instead of a legitimate law office with law clerks he has maintained a great suite of offices full of detectives, inspectors and accountants to see that the pool members did not break their pool agreements. Fifty different pools were operated from his office.

"Inasmuch as even the maximum fine would only represent a small percentage of the fortune he has made from his practices, I ask the court to impose a prison sentence."

Then Mr. Wise read a series of letters to prove his accusations. One of the pool members wrote to Jackson that he felt he was associating among thieves, except that he supposed there was honor among thieves and yet he was sure that there was no honor in their wire association. To one member who wrote Jackson that it looked as if the association was illegal, the latter responded: "What you say may be so, but the Department of Justice is too busy with bigger things to go after our small affair." Another member wrote to Jackson: "The association is bad enough in the eyes of the law and we know the courts will find against us if it is known that members are fined for cutting prices."

Crushing with Slow Chilean Mill

By Alexander McLaren*

At the Gold Belt mill a specially designed slow-moving chilean mill proved the most efficient crushing machine. The milling process described.

*Superintendent, Great Gold Belt Mining Company, Amboy, San Bernardino county, Cal.

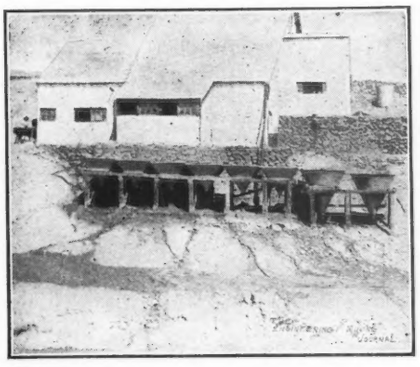
Within the last two years, in the capacity of superintendent of the Great Gold Belt mines at Amboy, Cal., it became necessary for me to design and erect a plant suitable for the reduction of the ores of that mine. This was complicated by a number of perplexing problems, chief of which was an extreme shortage of water. Several samples were sent for laboratory test (amalgamation, concentration, etc.), from which the best results showed an extraction of less than 60 per cent. by amalgamation. Various reliable firms made the tests and all were unanimous in their verdict and advice, viz.; stamps and concentrators (cyanide being out of the question owing to prohibitive amount of copper present). The slow-speed chilean mill was then brought into the discussion, backed by recommendations as to high extraction of gold, small consumption of power and water, and low cost of installation and maintenance.

Susannah Mill, Golden, Utah

I thereupon paid a visit to the Susannah mine at Golden, Utah, where a 10-ft. slow-speed chilean mill was in operation. The ore was an exceedingly hard quartz, no sulphides apparent, the gold being contained in the oxidized spots and cavities in the quartz. Delivered to the grizzly, the coarse was crushed by a 7x10 Dodge breaker down to 1-in. and fed to the mill by a belt-driven plunger feeder. Owing to the low water supply at that season, the mill could be operated only 16 hours out of the 24, crushing 20 tons during that time, obtaining an extraction of 85 per cent. by amalgamation on plates and in the mill, and making a tailing, 75 per cent. of which would pass through a 100-mesh screen, with a loss of water amounting to 180 gal. per ton of ore. The source of water supply was a spring flowing 2½ gal. per min. A conserving plant, situated immediately below the mill, consisted of a series of tanks in which the solids settled permitting the water to be used again; the loss was occasioned only by flushing and drawing the various tanks when they had become filled with sands and slime. This plant was equipped with a 25-h.p. gasolene engine, which, although pulling a 7x10 Dodge crusher, 10-ft. Lane mill, and 1½-in. centrifugal pump working against a head of 24 ft., did not seem to be working anywhere near its rated capacity, although at an altitude of nearly 7000 feet.

Design of Gold Belt Mill

This investigation, as well as extensive inquiry among others operating similar mills, led to the erection of a plant, the principal unit in which is a 7-ft. Lane slow-speed mill. As this plant was to handle the output of four properties scattered over an area nearly three miles square, a centrally located mill site was selected. The most feasible method of transporting the ore from mines to mill was by team, and for this purpose an automatic dump wagon, of three tons capacity, such as is ordinarily used by street and railway contractors, proved to be well adapted for that class of work. Loaded at bins at the mines from ¾ to 1½ miles from the mill, it was found that with one man and four animals 21 tons could be delivered to the mill in one day. This speed was due to good roads, rapid loading facilities from bins at the mines, and equally rapid unloading at the mill, where the dumping of a load containing from 2½ to 3 tons would not consume over three minutes; in fact, is often accomplished while the wagon is in motion, no stop being made and the readjustment of the dumping device taking place while the wagon is returning to the mine. The load is first driven on a scale where the weight is determined, thence to the rear of the mill where the load is dumped on to a flat grizzly over which the wagon is driven. This grizzly, 7x10 ft., is made of 12-lb. T-rail, with ball of rail down, spaced 1 in. apart and sustained by two I-beams and one channel embedded in concrete on each end; beneath the grizzly is a hopper-bottomed bin of 12 tons capacity. The fines drop through and the coarse is fed into a 7x10 Dodge crusher, the feed opening of which is set level with the grizzly floor. From this bin the ore is delivered to the main ore bin, having a capacity of 35 tons, by a double sprocket-chain elevator, 30-ft. centers, carrying 4x7-in. pressed-steel buckets spaced approximately 14 in. apart. Considerable trouble was experienced at first in feeding this from the chute and regulating the flow by a rack-and-pinion gate; a plunger feeder was then installed, driven by sprocket from the lower shaft on the elevator; this proved entirely satisfactory, feeding evenly and eliminating all choking and similar annoyances. From the main ore bin the material is fed by a belt-driven plunger feeder into the chilean mill, being introduced in the rear center of the pan and directly on the die, together with the required amount of wash water.



Great Gold Belt Mill, Amboy, Cal.

Construction of Chilean Mill

Chilean mills are fairly plentiful, but the fast-speed type, running about 35 r.p.m. is not so well adapted to amalgamation as the slow-speed type, running at 8 to 10 r.p.m. In the mill under discussion, four wheels, each weighing 1200 lb., equipped with tires 3 in. thick, 5 in. face and 42 in. diameter, made of Midvale steel, travel on a manganese-steel die 3 in. thick, 5 in. face, and 7 ft. outside diameter, each wheel covering this track 10 times per minute, or slightly over 219 ft.; this is apparently slow, but 4½ tons of rock in a tank above, sustained by the axles, gives additional crushing weight. At this rate of speed, the pulp is left on the die in the best possible manner to receive the impact of the wheel, while the finer particles rise in the slightly agitated body of water and discharge when sufficiently fine by an action somewhat similar to that of a hydraulic sizer. The pulp is subject to an abrasive action while in the pan, which has a tendency to brighten any particles of gold which may be rusty.

A groove 1 in. wide by 1 in. deep encircles the inside of the pan on the outer circumference of the die; mercury fed into the mill finds its way into this groove and the brightened gold particles also collect there. The outer pan, which is made of sheet steel with a batter of about 60 deg., is equipped on the inside with wooden baffles set about three feet apart and reaching from within one inch of the die to the top of pan. These baffles retard the flow of the current and catch a great deal of amalgam which is thrown up by the wheels.

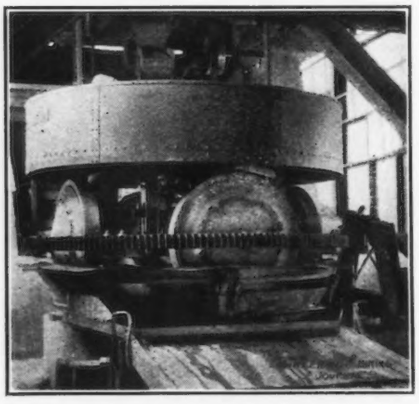
Approximately one-third of the outer circumference of the mill pan is fitted for discharge of pulp. It was soon found that the fineness or coarseness of screen had absolutely nothing to do with the fineness of pulp, that being controlled altogether by the hight of discharge and speed of mill; further experiment showed that the screen when fastened to the ordinary screen frame only had the effect of retarding the passage of pulp and materially decreased the mill output. A basket-shaped device made of common fly screen was then fastened to the outside of the discharge or chuck block, the overflow from the mill discharging into it; the basket caught chips fuse, etc., that would cause clogging if permitted to pass over the plates and through the discharge pipes. The degree of fineness of the pulp is regulated by the hight of discharge, and in that respect the mill is a pulverizer and hydraulic sizer in one; the finer the particles the higher the point of suspension in the liquid body. The pulp on being examined under a microscope appears to be a mass of rounded particles with an almost total absence of the angular, sharp-pointed particles of stamp-battery tailing; hence a better product for such subsequent treatment as concentration. From the mill, the pulp passes over 5x8-ft. amalgamating plates, in two sections of 4 ft. each with a drop of ¾ in. between, and it is found that 95 per cent. of the amalgam taken from these plates adheres within eight inches of the top of the upper plate. From the plates the pulp passes through a Pierce amalgamator which catches any loose quicksilver or amalgam detached from the plates during the process of brushing up.

Clarifying Wash Water

A Traylor concentrator was installed but, owing to shortage of water and the small amount and value of the concentrate, the use of the concentrator was abandoned as unprofitable. The tails and wash water are delivered to a series of settling tanks. These consist of six galvanized-iron tanks 5 ft. square on the top and 5½ ft. deep, tapering to a 5-in. opening at the bottom; the water flows in a thin sheet over a lip 4 ft. 10 in. long and perfectly level to the succeeding tank. The first two in the row, in which settle the coarsest tailings, are equipped with tapering square plugs, made from pieces of 6x6 square timber, which fit tightly into castings riveted to the bottom of the tank; they protrude above the top of the tanks and have a short piece of 1-in. pipe running through them at right angles, for a handle. When the tank requires emptying, the operator merely shakes the plug from side to side, thereby loosening it, and pulls it up through the body of pulp, permitting the tails to run through the opening at the bottom. When empty, the plug is once more inserted. Only the first two of the tanks are thus equipped; the rest, including two 6x6-ft. conical tanks not heretofore mentioned, are equipped with short wooden plugs bored and fitted with 1½-in. Sargent molasses valves through which are drawn the slimes as occasion demands. The last four of the square tanks are fitted with wooden baffle boards, the width of tank and one foot deep, set at right angles to the line of flow, which aid materially in settling the slimes. From the last of these tanks the water is delivered in a comparatively clear state to a sump tank of 500 gal. capacity, from which it is raised by 1½-in. centrifugal pump to the supply tank at the rear of the mill. The deficit occasioned by evaporation and flushing out of settling tanks is made up from the clear-water tanks.

Operation of the Plant

As this plant was built to handle ore from several different properties, all of different character, we will take for description that on which the laboratory



Slow-speed Chilean Mill

tests were made, a hard, close-grained quartz, carrying hematite in its hardest form, the gold in the hematite being much in excess of that in the clear quartz and in a finely divided condition. The quartz and hematite occur in nodular form, nested in a brecciated mass between walls. Of this the nodules represent 30 per cent. of the whole, and, being broken in the mine, 65 per cent. will pass through the grizzly. Crushing at the rate of 20 tons per day of 24 hours, using a 4-in. discharge and common window screen to catch chips, an 88.1 per cent. extraction was made by amalgamation alone. Screen test from tails gave the following result:

	Per Cent.
Stayed on 20 mesh	0.10
Stayed on 30 mesh	0.27
Stayed on 40 mesh	0.37
Stayed on 60 mesh	1.59
Stayed on 80 mesh	3.87
Stayed on 100 mesh	8.10
Passed 100 mesh	85.79

Assays of the different sizes of pulp show higher values in the coarser material than in the slimes. In stamp milling the results would be the opposite as the splashing would throw the finer particles of gold into suspension and beyond the reach of anything but cyanide. With the chilean mill it is different; the fine particles liberated from the gangue on the die are permitted to remain there and they readily unite with the mercury. This plant has crushed at the rate of 20 to 30 tons per 24 hours and is easily handled by one man on a shift. Gasolene power is used, consuming, under heaviest load, 2.17 gal. of distillate per hour. A conservative estimate based on tons crushed, labor, fuel, wear and tear on machinery, etc., shows a cost of $1.50 per ton of ore milled, which, considering the size of plant and a 14-mile haul from the railroad, is a low cost of milling.

Uruguay Mines and Minerals*

The mineral wealth of Uruguay is beginning to attract the attention of the capitalists of Europe[1]. A deposit of high-grade mica has been discovered in the department of Canelones, 2½ miles from Toledo station.

The Uruguay Manganese Company's petition for a concession, including ten years' exemption from export duties, has been granted, and authority has been given for the construction of a branch railway to the mine. The work of developing the mines in orde- to prove definitely the quality and quantity of the ore is being actively advanced. Analyses of samples obtained from the deepest cuts are reported to have shown 49.8 per cent. metallic manganese, with 1.8 per cent. silica.

According to a report of the Uruguay Consolidated Gold Mines Company, its property consists of five concessions, or 1040 acres. The estimated value of the ore is $4.38 per ton.

New Mexico Ore for Export

Special Correspondence

Representatives from German smelteries are at present in the Pinos Altos district and are conducting tests on ores, with a view to determining their desirability, according to recent reports. The ores are said to be in demand at the German smelteries because of the zinc which they contain and because the German plants are credited with securing practically the full value of the ores treated. In the event that the negotiations between the agents and the local mine owners are brought to a successful issue, it is probable that the ores would be shipped to Germany via Galveston, Tex., as it is believed that satisfactory rates can be secured, and that large quantities of the ore would go as ballast.

[1]*Daily Consular and Trade Reports*, June 15, 1911.

Experiments on Mineral Flotation

By Kenneth A. Mickle*

Laboratory study into the behavior of a number of minerals when subjected to the conditions met in the several flotation processes.

NOTE—Abstracted from *Proceedings* of the Royal Society of Victoria, Vol. XXIII (N. S.), Part 2, March, 1911.

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Much of a practical nature has been written about the numerous flotation processes now widely employed, but little has been published concerning the underlying principles. The following paper is based on a series of laboratory experiments on the buoyancy of a wide variety of minerals subjected to varying treatments, viz.: Water, cold and hot, at normal and at reduced atmospheric pressures, free from air and saturated with gases; acids, strong and dilute; oils, alone and in combination with water; alkaline solutions; minerals bright or tarnished; in short, every probable combination of circumstances in which separation by flotation can be undertaken.

FLOTATION IN WATER

Cold Water—Many minerals when dropped carefully onto the surface of water remain on it and do not sink; some at once sink to the bottom. Some minerals, when ground to pass a 30-mesh sieve, form a film on the surface of the water, and this film will support a considerable weight. A certain sample of zinc-blende concentrates could be heaped up in this manner to a depth of ¼ in. on the surface of water in a 50-c.c. beaker. The weight of material was 15 gm., and the top portion was quite dry. The following is a list of the minerals tried that would float on the surface of water: Galena, blende, sulphur, azurite, malachite, rhodonite, garnet, calcite, mica, telluride of gold, pyrite, pyrrhotite, wolframite, cassiterite. All the metals in the form of foil would easily float. Some samples of quartz will float and others will not. Particles of glass and turquoise would not float.

The weight of each particle on the surface causes a distinct depression or sag round itself, and the apparent attraction of one particle for another is probably due to the depressed surface caused by this sagging. If alcohol in the form of a drop on a glass rod be brought near the particles floating on the surface, the particles are repelled from the rod. If alcohol is added to the water the particles become wetted and sink. Caustic soda acts similarly. This is apparently a surface tension phenomenon. In the case of alcohol on the glass rod, the vapor of the alcohol mixing with the water decreases the surface tension and increases the adhesion of the water for the mineral. The water wets the particle at a higher level on the side nearest the glass rod; an inclined plane is formed on the side furthest from the rod, and the particle is apparently repelled. Water has the greatest surface tension of all liquids, under ordinary atmospheric conditions, except mercury, and thus, if another liquid is added to it, the surface tension is decreased. If pulverized mineral is wetted and covered with water, and then is exposed to the air by causing the water to run to one side of the containing vessel and the water is then brought carefully back, some of the mineral will be seen to float on the surface of the water. This form of flotation takes place to a greater or less extent with most minerals, and is apparently a different phenomenon from the simple floating of particles by dropping them on the surface. In the latter case there is an almost continuous film of air surrounding the under side of the mineral, and by far the greater portion of it is projecting above the surface of the water. That the film is not continuous, and that the particle is partly wetted, can be shown by floating some magnetic substance, as pyrrhotite, and attracting it with a magnet, when the surface of the water will be dragged up with the mineral. When the substance is finally lifted out, water is carried up to the magnet. In the former case, the particles will be seen to be almost entirely submerged, only a portion like a pin's point being above the surface, and, although a distinct depression of the surface is caused, it is not so deep as in the other case.

Hot Water—In hot water the behavior of minerals is different. Most of them will float for a few seconds only, becoming wetted and sinking, usually a bubble of gas leaving each particle as it sinks. Fine-grained material can be heaped up as with cold water, a large number of bubbles being observed on the under surface of the mass.

Under Water—When minerals are submerged in water and the water is heated, many of them will float. Sulphur, crystalline azurite and malachite, some galenas, some blendes, some chalcopyrites and stibnites, and some of the metals, copper being the most persistent, will float in water on heating. A sample of zinc concentrates from the Potter process (floated with H_2SO_4) floated when heated in water, and when boiled the "scum" continued indefinitely. If boiled violently and continuously, the concentrates sank, but if allowed to cool they again floated on heating. This was repeated 12 times, and would apparently continue indefinitely, if after each test the water were allowed to cool for some time. Air will get into boiling water, being either dissolved or carried down mechanically as bubbles. A large beaker of distilled water was boiled continuously for two hours. An inverted funnel was then placed in the beaker and an inverted burette filled with the boiled water was placed over the stem of the funnel. Air then slowly collected in the burette. In some cases, minerals appear to evolve a gas, and usually the water begins to boil and water vapor to form first on the minerals introduced into it.

Reduced Pressure—Many substances when sunk in water will rise to the surface when the pressure above the surface of the water is lowered. Among the substances tried the following floated: All the metals in the form of foil, sulphur, graphite, mica and zinc-blende concentrates. Particles of galena, zinc blende, cerussite, river sand, and calcite came to the surface, but sank again. When a mixture of particles of zinc blende and river sand was put into a vacuum flask under water under reduced pressure, it was noticed that the zinc blende came up more persistently than the sand, which rose to the surface three or four times, but would not do so again. Particles of mineral are caused to float by gas bubbles attached to them. In some cases these bubbles are strongly attached to the minerals. On some minerals bubbles will form, but the minerals do not float, as quartz, garnet, gypsum, hematite, wolframite, cassiterite and glass. Pieces of metal in the form of foil will float even after being repeatedly sunk. If the water is boiled free from air the metals will not float if the first bubbles to attach themselves are removed. A piece of copper foil, immersed in air-free water, which would not float when the pressure was reduced, floated on the surface when brought in contact with the vapor above the surface of the water. Crystalline pieces of the following minerals, under water and with reduced pressure, were all coated with bubbles: Galena, blende, garnet, tourmaline, pyrite, gypsum, andalusite, calcite, cerussite and quartz. These minerals were then placed in water boiled free from air, and again became coated with bubbles on reducing the pressure, thus showing that some gas is carried down with each mineral as it sinks. The metals also had bubbles attached to them, but on freeing these with a glass rod only a few very minute ones formed

again. After the bubbles have formed on these minerals, if atmospheric pressure is restored, the bubbles become almost invisible, but expand again in the same position on again lowering the pressure. Tarnished minerals form as many bubbles on their surfaces as the clean ones.

Flotation in Dilute Acid Solution

Cold—Similar to water even with strong H_2SO_4.

Hot—None of the minerals would float when sprinkled on the surface of a hot H_2SO_4 solution, even when very dilute (1 per cent.), but became at once wetted and sank. Copper foil will float on a hot, 3 per cent. H_2SO_4 solution. Zinc concentrates form a film the thickness of one particle only, the remainder falling through the surface, but coming up again in the form of agglomerated masses.

Heated in Acid Solutions—Most of the sulphides will float if heated in a weak H_2SO_4 solution. Some samples of pure galena and zinc blende would not float, but on the addition of calcite and generation of CO_2 they floated. Hematite, biotite, quartz, wolframite, cassiterite, rhodonite, calcite, siderite, muscovite, serpentine, would not float. With the sulphides, H_2S is given off to a greater or less extent in every case. A sample of copper matte would not float in acid solution. To show the amount of acid required a small test with a sample of the South Mine, Broken Hill, tailings was carried out, taking 10 grams of the tailings, 50 c.c. water, different amounts of acid, and heating to about 95 deg. Centigrade:

0.36 per cent. H_2SO_4; no float.
0.72 per cent. H_2SO_4; small scum formed.
0.90 per cent. H_2SO_4; poor float.
1.40 per cent. H_2SO_4; good float.

These tailings contain much calcite, and therefore use up more acid than most of the other companies' tailings.

Reduced Pressure—The same lot of crystalline particles tried with water alone were tested under reduced pressure in an acid solution ranging from 1 up to 10 per cent. H_2SO_4. The bubbles formed as before, but were of a different nature, appearing to be larger and coming away from the minerals more readily. Fewer bubbles formed on the quartz and gypsum than on the other minerals. In the case of quartz and rhodonite and the other silicates, a few bubbles were carried down, but on shaking these off no others formed. This also was the case with copper foil. Bubbles formed on the sulphides, garnet and tourmaline even after those first formed were detached. Some cubical fragments of galena were coated with lead chromate and sulphate, respectively, and immersed in an air-free acid solution, under reduced pressure. Only a very few bubbles formed on these particles. Most of the sulphides will not float in the cold with dilute acid. The zinc blende in a sample of South Mine tailings kept coming up to the surface, but fell back again. The carbonates are attacked by very dilute acid solutions under reduced pressure. It is interesting to note that siderite and magnesite are attacked by cold acid under reduced pressure.

Some Broken Hill Proprietary's zinc concentrates, washed free from soluble salts, were boiled in a 2 per cent. H_2SO_4 solution. The following metals went into solution, Fe, Al, Zn and Mn, while H_2S was given off. A sample of the Central mine's concentrates (oil and acid process) was washed with strong NaOH, and then washed free from NaOH. The zinc blende would not then float on boiling air-free water, but when made acid with H_2SO_4 a float was obtained. No float could be obtained by adding ammonium carbonate. Another sample of the Proprietary's zinc concentrates washed free from acid, then washed with strong NaOH and finally washed free from alkali, would not float on hot water, but floated on adding acetic or sulphuric acid.

Flotation on Oils, Etc.

None of the minerals tried would float on the surface of oleic acid (commercial), kerosene or alcohol. Copper foil floated on oleic acid, but not so persistently on kerosene. Iron wire would not float on kerosene or oleic acid, but showed a tendency to float, not sinking immediately. Zinc blende, galena and the other minerals would not float on alcohol, but did not immediately sink.

Hot—None of the minerals floated when heated in kerosene or oleic acid.

Reduced Pressure—None of the minerals or metals floated when immersed in oleic acid, alcohol or kerosene under reduced pressure.

Behavior of Oiled Minerals in Water and Acid Solutions

Nearly all the minerals and metals will absorb oil if shaken in water to which oil has been added. If previously oiled with oleic acid, vaseline or kerosene, nearly all minerals will float in water. Some float in the cold; others require heating or reduced pressure. The following float well: Calcite, sulphur, galena, garnet, zinc blende, wolframite, cassiterite, siderite, cerussite, magnesite, azurite, malachite, rhodonite, some quartz and the metals in form of foil. The following give no float, or a very poor one: Muscovite, amorphous malachite, turquoise, gypsum, quartz and particles of slate. Calcite and muscovite if crushed together can be separated by oleic acid, the calcite floating and the muscovite not absorbing the oil. Copper matte will float with oleic acid in H_2SO_4 solution. Whether a mineral is caused to float or is merely collected together in a mass or in small rounded balls, or is made granular but coherent, is dependent on the quantity of oil used. A series of tests showed that with an excess of oil over the mineral the latter was carried to the surface of the water by the lighter oil. With oil and the mineral in certain ratios, as 5 grams oil to 20 or 30 grams of zinc blende, the oil and mineral formed one globular coherent mass. By increasing the proportion of mineral, smaller rounded masses of oil and mineral formed which would not float; finally with 150 grams of mineral and 5 grams oil a granular product was formed which would float on violent agitation, being buoyed up by attached air bubbles. On adding acid to the minerals which have absorbed oils in presence of water, most minerals, other than sulphides and metals will not float when heated, the acid apparently causing them to separate from the oil. The amount of acid required to make the action selective is very small, but from the results of numerous tests it is apparent that with only minute quantities of acid the action is only partially selective. If more acid is used the freer from gangue the concentrates will be. Calcite and oleic acid will not mix in the presence of oxalic acid, although the calcite is not apparently attacked. Calcite will absorb oleic acid in the presence of acetic and lactic acids. There is no very marked difference between the behavior of sulphur and oleic acid in an acid solution or in water. Carbon bisulphide acts like an oil, and is apparently absorbed by the minerals.

Reduced Pressure—Crystalline fragments of tourmaline, garnet, blende, galena, pyrite, quartz, gypsum, andalusite and calcite were taken, two of each, one oiled with oleic acid and the other unoiled. These were immersed in water, and the pressure reduced. Bubbles immediately formed on the oiled minerals, and on further decreasing the pressure, bubbles larger and in greater number formed on the oiled than on the unoiled minerals. The bubbles on the oiled and on the unoiled minerals were different, those on the oiled being of an inverted watch-glass shape when first formed. On adding H_2SO_4 the bubbles changed in character, and most of the bubbles left the unoiled quartz and gypsum, but not the other minerals. At the lower pressure CO_2 was evolved from the calcite, which was not attacked at first, showing that the acid solution gets under the oil film on the mineral. With a lens minute specks could be seen on the faces of the pyrite crystals which gradually grew into larger bubbles on reducing the pressure. The bubbles on the oiled minerals were of a more permanent character and the manner of leaving the minerals was also different. With the oiled minerals the bubbles became distorted and dragged away more than with the unoiled minerals. On warming the solution, the bub-

bles clung much more tenaciously to the sulphides than to the other minerals, the quartz, calcite and gypsum being almost free from bubbles.

If a layer of oil is floated on water and a particle of mineral, as galena or quartz, is dropped on it, the mineral will sink only as far as the top of the water and remain there. Minerals will sink through alternate layers of different oils floating on water, and will remain floating on the top of the water. If a particle of some mineral is sunk in water and a layer of oil is floated on top of the water, and if the pressure be reduced above the surface of the oil, the mineral particle will rise as far as the surface of the water, but will not penetrate the oil layer. Three beakers were taken, each containing a saturated CO_2 solution. A layer of oleic acid was added to form a layer over the surface of one, kerosene in another and petrol in the third. Particles of different minerals were then dropped into the beakers, and their behavior noted. All the minerals carried down oil with them in the form of a circular "blob." CO_2 gas immediately began to collect under the surface of the oiled particles in the form of very small bubbles, which collected to form one large bubble; on becoming too large it broke away and came to the surface, the oil returning to its original form until another large bubble formed. On adding H_2SO_4 many bubbles, and apparently the excess of the oil, left the minerals, and after standing or heating, quartz, calcite and gypsum became practically free from bubbles. The sulphides, metals and garnet still had bubbles collected on them, but in a different form, each bubble being separate and not combining with the others to form one large bubble under the surface of the oil as was the case with water alone.

A very small amount of oil only is required to oil a considerable amount of any mineral. Some South Mine tailing weighing 20 grams was put into water, 1 drop (0.026 gram) oleic acid added, the mixture shaken and put in a vacuum flask. On reducing the pressure the whole product, metallic and nonmetallic, floated to the surface. With 40 grams only about half was raised.

Flotation in Alkaline Solutions

Most minerals will float on the surface of NaOH solution, but for a few moments only, and then become wetted and sink.

Hot—When heated in a solution of NaOH, the minerals will not float. On adding an ammonium salt, although gas is given off, no float takes place. With some zinc concentrates that had been previously floated, a good float was obtained in an ammonium carbonate solution. With NH_4Cl partial and nonselective floating was caused. Oleic acid saponified with ammonia will cause nonselective flotation, and on adding H_2SO_4 till acid, the silicates will sink and the sulphides remain floating. A sample of zinc concentrates would not float in NaOH, and on addition of H_2SO_4 till acid would float only after heating for a considerable time.

Reduced Pressure—Bubbles collected on the minerals in NaOH solution under reduced pressure, the solution being free from air. On making acid with H_2SO_4 very few bubbles remained on any of the minerals, but more were on the sulphides than on the quartz and silicates.

Flotation in Saturated Solutions of Gases

Copper foil and other metals and also all the minerals constituting the Broken Hill tailings will float in water saturated with CO_2, being brought to the surface repeatedly by the gas bubbles. Bubbles form on all the minerals, and are not confined to the sulphides. Very few form on gypsum and fewer on the quartz than on the sulphides. On addition of H_2SO_4 no bubbles remain on the gypsum and very few on the quartz, the garnet still having bubbles attached to it. The action is similar with a saturated solution of SO_2. Hydrogen peroxide is also similar in its action to the saturated solutions. The manner in which bubbles of gas are formed in a solution is important as regards their subsequent attachment to the minerals. A rapid current of bubbles may be evolved, but the bubbles may not attach themselves to mineral particles, and thus may not be of any use in their subsequent flotation. Sometimes the rapid evolution of a gas is useful, as in the case where flocculent masses of the sulphides are held together by gas bubbles insufficient to carry them to the surface; the rush of bubbles underneath these agglomerated sulphides causes them to be carried to the surface. The condition that seems to be best for the attachment of gas bubbles to minerals and metals is when a saturated solution is slowly evolving bubbles of gas that are being thrown out of solution by rise of temperature or lowering of pressure. This takes place to a certain extent in all the flotation processes where a hot solution is used, the dissolved air, CO_2, H_2S and any other gases in solution being driven out when the temperature is raised. In the case of saturated solution of gas, bubbles will form on almost anything introduced into the solution. On addition of acids the bubbles have a tendency to select the sulphides on which to form.

Film Flotation

Film flotation is the term used to describe flotation when the mineral floats on the surface of the liquid to the depth of one particle only, and not as a coherent scum as in the case of the Potter and other processes. In film processes, as the De Bavay, the sulphides, after being wetted, are brought into contact with the air and fed onto the surface of water, where they remain floating as a film and not as a scum. A sample of zinc blende obtained by film flotation (using H_2SO_4 and oleic acid) was immersed in boiled water and boiled under reduced pressure for three hours, as much of the air being pumped out as possible. All the mineral was then on the bottom of the flask. The top of the flask was then closed, and on bringing the mineral into contact with the vapor above the water, the film was again formed. When examined with the aid of a lens the film was seen to be almost entirely submerged, only fine points of the particles projecting above the surface. A film of magnetic sulphide of iron on the surface of water, when attracted by a magnet, drew up the surface of the water with the mineral. Copper foil will not float in air-free water under reduced pressure, but if allowed to come in contact with the vapor above the water it will float.

Effect of Tarnishing

If the surfaces of sulphides are tarnished, as a rule these sulphides will not float. Taking the Horwood process as an example, the mixture of lead and zinc sulphides is given a slight roast, which is sufficient to cause the galena to become coated with lead sulphate. The zinc blende is not much altered at the low temperature at which the roasting is carried out. When the material is then heated with an oil and acid solution only the zinc sulphide floats. If galena is coated by treating with strong H_2SO_4 it has a tendency not to float; chromic acid has the same effect. Chlorine and nitric acid, which rapidly tarnish the surface of galena, do not in any way prevent flotation, but on the other hand have a beneficial effect. This may be due to the liberation of free sulphur (which does take place) on the surface of the sulphide, sulphur being one of the most easily floated substances. Some ores that will not float in their natural condition will float after being heated, the slight calcining having a beneficial effect on the flotation. This is noticeable with some of the heavy Tasmanian zinc-lead ores.

Summary

All minerals adsorb gases. Sulphides appear to adsorb CO_2 naturally. The consequence of this is: (1) Particles are not wholly wetted when immersed in water. (2) Particles also tend to float when sprinkled on the surface. (3) When immersed in water and heated, the air or gases dissolved in water will collect on the particles, and float or tend to float them to the surface. (4) Saturated solutions of gases in water evolve gas which collects on all particles.

The Addition of Acids—Metallic particles, such as sulphides and metals, when immersed in dilute acid solution, are not wholly wetted, but particles of rock

materials become more readily wetted and give off their adsorbed gas. When different dry minerals are sprinkled on the surface of dilute cold acid, the tendency for them all is to float as in water. The minerals are more readily wetted by hot acid solutions than cold.

The Addition of Alkalis—When different mineral particles are immersed in an alkaline solution, they tend to part with their adsorbed gases, and will not float even when heated. When sprinkled dry onto the surface of the solution, they remain for a few seconds only and then break through.

Flotation of Sulphides—Given a starting point, any gas generated in or introduced into a solution will tend to collect on the surface of particles. If acid is added, the gases will leave the gangue particles and collect on the sulphides; the latter, therefore, tend to float and the former to remain under the surface of the liquid. When substances in the solution, such as carbonates, are attacked by acids, the gases evolved saturate the liquid and commence to grow on the sulphides. Sulphureted hydrogen, steam, air and any other gases either present in the solution, introduced into it or evolved from the minerals present, assist flotation, provided the sulphide particles have dry points on them for the gases to become attached to. Some sulphides naturally adsorb gases, and such sulphides readily float. The bulk of Broken Hill ores may be taken as examples. Other ores require preliminary treatment, so as to alter their surface to some extent. This may be done in certain cases by merely heating to 250 deg. C., or immersing in some solution which will attack the sulphides, such as nitric acid or chlorine solution. Sulphides which condense or adsorb gases well will gather together in a solution as flocculent masses, while those that do not, remain individually distinct, like grains of sand.

Heat an Aid to Flotation

In certain cases sulphides will float in acid solution at ordinary temperature, but for the most part, with dilute acid, flotation starts at about 80 deg. C. The explanation put forward that flotation at that temperature is due to the fact that certain carbonates, such as rhodochrosite, siderite, smithsonite, are attacked and give off CO_2, does not appear to be correct, for under reduced pressure these minerals are attacked but flotation does not take place. The presence of silicic acid and sulphur, as stated by De Bavay as necessary for a coagulum, is not necessary in many cases of successful flotation. When minerals are treated with dilute acids, and then exposed to the air, certain sulphides adsorb gases on their surface. If they are alternately wetted and exposed to the air, they will become entrapped by the surface film of water with which they are brought in contact. The appearance of the film is the same as that of a bubble of gas under the surface of a solution with sulphides attached. The sulphides in both cases adhere to the surface film of the bubble or free surface of the liquid, but are mainly below the surface itself. The gas obtained in all cases from experimental work, and also from samples obtained from various flotation plants, was CO_2, with varying quantities of nitrogen and oxygen. There is no doubt that most of this gas is generated from gangue particles in the ore, and being more soluble in the liquid than the other gases, collects readily on the surface of the sulphides.

In all experiments with sulphides, carbon dioxide was obtained on exhaustion. This gas must have been present either in the form of a compound easily decomposed by heating or by reducing the pressure, or as a gas condensed on the surfaces of the sulphides and there retained with greater force than other gases present. It was found that the carbon dioxide was the last gas to come off.

Effect of Oils—The effect of oils has long been known in protecting minerals from being wetted by water, owing to the oiling of their surfaces, and also the affinity of oils for metals and many metallic substances. Nearly all the minerals tried could be coated with oil either in the presence or absence of water. This seems to be connected with the adsorption of gases on the particles themselves, for if the particles are deprived of their gas, then as a rule they do not become coated with oil. It would therefore appear that the oiling of particles is dependent on their gaseous attachments. If the particles are oiled to a minute extent, the gases previously adsorbed are retained, and if a solution is heated more gas will become attached to the particles, and flotation will ensue. An oil float may be obtained without acids. Nearly all minerals will float after being oiled.

The flotation is apparently due partly to the lesser density of the oil and the presence of gases adsorbed on the minerals or entangled in the oil. If a large quantity of viscous oil is used gases become entangled in it and the product is oily. In course of time the particles will drop away from it, carrying down attached globules of oil. When a lesser amount of oil is used the product becomes a coherent mass like putty, showing no apparent tendency to float. On further decreasing the quantity of oil, the product becomes firmer and breaks up into rounded pellets. With a still less quantity of oil, when shaken up with water in presence of air the product becomes flocculent and increases in volume. This flocculation is due to the adsorption of gases. With very minute quantities of oil the flocculation becomes more pronounced, and the tendency to float becomes greater. These results may be obtained with gangue and metallic substances. Gases collect more readily on oiled than on unoiled particles.

Acid Gives Selective Floating

Effects of Acids on Oiled Particles—The addition of acid causes a more selective action. If oiled gangue and metallic particles are immersed in water, and acid is added, then the oil will tend to leave the gangue particles and become attached to the sulphides. The action of the oil in this respect is similar to that of the gases attached to different minerals, and probably is due to the same cause.

If an ore is treated with an acid and the acid is removed, and if the particles are then oiled, the oil tends to become attached to the sulphides only. This is probably due to the removal of the gas from the gangue, which prevents oiling. If acid and oil are added together, the action of the oil is selective, as in the previous case. The presence of oil on their surface does not prevent minerals from being attacked by acids.

The amount of acid required for selective flotation depends on the composition of the ore, the temperature and the pressure existing at the time. Generally it may be stated that an increase of acid will give a purer sulphide product, but flotation will take place at a lower temperature, and with a lesser amount of acid, with oil and acid than with acid alone.

A selective flotation can be obtained in some cases by treatment with a chlorine solution previous to the addition of oil, and without the addition of acid. Some of the light volatile oils will cause flotation in an acid solution at a lower temperature than the heavier and thicker oils. With some Broken Hill tailings a flotation takes place at ordinary temperature with sulphuric acid and a volatile oil.

Effect of Oils and Alkalis—Flotation can be obtained in alkaline solutions when oil is used, but in every case tried the action was nonselective. On making the solution acid the action becomes selective, only the sulphides floating.

The flotation of mineral particles appears then to depend on the fact that the particles having gas attached to them become entangled, or caught, by the surface film of a liquid. This film may be (1) the free surface of a liquid, (2) the surface of a bubble of gas under the surface of a liquid, or (3) the surface of a bubble of gas above the surface of a liquid. Once the particles are entangled in this film they are sustained there. That a considerable weight may be supported by this surface film is shown by the experiment of floating fine-grained mineral on the surface film of water.

Genesis of Bolivian Tin Deposits

By Miltiades Armas*

Cassiterite lodes were deposited by condensation from vapors, at high temperature and pressure, at various periods corresponding to recurring earth movements along the Andes.

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During my residence in Bolivia, for many years, the formation of the tin deposits has attracted my attention; their deep-seated origin has seemed daily more evident, while the theories of lateral secretion failed to satisfy the facts. A clearer idea will be conveyed if I digress for a while in order to establish certain geographic and geologic phenomena, closely related with vein formation in Bolivia, and with tin deposits in particular.

Geographic Considerations

The great mountain chain known as the Rockies in the United States, Sierra Madre in Mexico, and the Andes in South America, on entering Bolivia bifurcates and forms the eastern cordillera, or *Cordillera Real* and the western, or *Cordillera Occidental*, thus forming an irregular ellipse having its southern vertex near the Argentine frontier, while the northern is occupied by Lake Titicaca, 6000 sq. km. in area, with a maximum depth of 530 m. and an elevation of 12,500 ft. above sea level. The approximate area of this ellipse, thus limited by the two cordilleras, is about 210,000 sq. km., its transverse axis being not less than 900 km. and its minor axis about 300 km.; it constitutes the high plateau of Bolivia, whose elevation above the sea level averages 13,500 ft. In the following remarks I will designate the two branches of the Andes by their local names, viz.: *Cordillera Real* and *Cordillera Occidental.*

The highest peaks are found in the *Cordillera Real*, such as the glacier Illampu or Sorata, 21,275 ft., Kaka-aka or Huayna Potosi, 20,320 ft., Illimani, 21,190 ft., all covered with perpetual glaciers. Distant 100 km. on a bee line from Tacna on the coast of the Pacific Ocean rise the volcanoes, Tacora and Sahaura, towering 19,700 ft. above sea level. Then comes the high plateau, about 300 km. wide (13,500 ft. high), after which the *Cordillera Real* rises higher still. Eastward, toward the Atlantic Ocean, five lesser ridges rise in succession.

Challana Glacier Group, Bolivia

Erosion in Glacial Drift Near La Paz, Bolivia

Geologic Considerations

In the Bolivian Andes one can distinguish at least two orogenic movements occurring at two different geologic periods; the more recent one is that of the *Cordillera Occidental*, which occupies a zone of dislocation nearly parallel to the Pacific coast, with an approximate NW and SE trend from the United States to Patagonia. Along this weak part of the earth's crust, nearly all the volcanoes are situated, whose representatives in Bolivia are Tacora, Sahaura, San Pedro, etc. The two ranges may be further distinguished by classing the *Cordillera Real* as a type of folded mountain, due essentially to the crumpling of the earth's crust, while the *Cordillera Occidental* belongs to the accumulation type (such as the volcanoes). As to the relative age of these two ranges, the *Cordillera Real* appears to be much older than the *Occidental.*

Glacial Action

Glacial accumulations on both sides, but particularly along the western slopes of the Andes, cover enormous areas to a depth of many thousand feet. Lateral streams from the glaciers have cut deeply into these accumulations, forming valleys whose axes are nearly at right angles to the cordillera. The river La Paz is particularly interesting as one of the few which, originating on the western slope of the Andes, finds its way into the Atlantic Ocean, constituting one of the sources of the Amazon River. Issuing from a small lake at the foot of the Cuninticuta glacier, it runs through the valley of La Paz, divides the city in two, and after a tortuous course, more or less parallel to the cordillera, reaches La Angostura where it crosses the Andes through a mere gully of a score of feet in width. The La Paz river starts at an altitude of 15,000 ft., and at Angostura its altitude is 6000 ft.; it cuts through at least 4000 ft. of mostly glacial detritus in a course of about 100 km. before reaching bedrock at La Junta, a few kilometers above Angostura.

Structure at La Paz

About 30 km. from the source of the river is situated the city of La Paz, at an altitude of 12,054 ft., and 1312 ft. below the level of the high plateau. Lying horizontally on the glacial detritus is a white stratum of volcanic trachytic tuff, which in turn is covered by more glacial deposits. This volcanic tuff covers vast areas. Toward the west, in the Coro-

coro district (famous for its red Mesozoic sandstones impregnated with native copper which have been exploited from time immemorial), these tuffs are found interstratified between Mesozoic sandstones and marly clays of more recent date.

At various points, particularly near the *Cordillera Occidental,* as Viacha, Patacamaya, etc., trachytic flows are found breaking through Paleozoic slates and, in some other sections of the country, through Mesozoic sandstones. These trachytes are the same as those near La Paz. Examination of the glacial detritus shows that it is composed of Paleozoic and Mesozoic rock.

To sum up, it appears likely that toward the end of the Cretaceous period a thrust, extending along the coast of South America, upheaved the *Cordillera Real* perpendicular to the direction of pressure, causing also a line of weakness in the earth's crust more to the west and parallel to the principal axis of the cordillera. At a much later period, possibly a post-glacial one, at various successive times the materials forming the chain of the *Cordillera Occidental* were ejected. I would lay stress on the fact that there have been various orogenic movements on both cordilleras, but particularly on the western one, and the genesis of the various mineral deposits has also occurred at different ages, corresponding with the successive movements.

Importance of Erosion

After the great upheaval which resulted with the appearance of the *Cordillera Real,* the most important phenomenon was the appearance of the ice sheet, which covered immense tracts in South America. The magnitude of the glacial phenomena is stupendous, extending for many hundreds of miles both ways from the Andes.

On the western slopes of the Andes, the depression formed by the upheaval has been entirely filled with glacial detritus. The peaks of the Andes certainly occupied at the glacial epoch a far higher level, though it may be thought that the gradual upheaval may have kept pace with the denudation; this phenomenon is probably taking place today.

The Tin Formation

The veins containing tin are mostly situated on the high ranges of the *Cordillera Real,* at great altitudes. The formations in which they usually occur are mostly slate and quartzites, in both of which rocks metamorphic action has been active. In a general way the deposition of tin took place within a zone of fractures and dislocations running nearly parallel to the principal axis of the mountains. Fissures at right angles to these lines of dislocation, which seem to have resulted at a later period, rarely, if ever, contain tin.

I have shown that enormous rock pressure has been removed, and that tin deposition originally took place under high temperature and pressure. So far the theories of Van Hise, Sandberg and others do not satisfactorily explain many phenomena of ore deposition in general and of tin in particular, but a more satisfying explanation is that offered by the recent discoveries made in chemistry, particularly those of Moissan.

At very high temperatures the affinities of the elements are quite different from those existing at lower temperatures and pressures. At high temperatures and, in our case, under enormous pressures, the conditions of the electric furnace are nearly approached, and as at very high temperatures, no combinations with either oxygen or the halogen group are possible, metals in the gaseous state can combine only with such elements as silicon, carbon, phosphorus, arsenic, sulphur, etc.; in our case, tin may have a marked affinity for phosphorus and silicon. Admitting this, many phenomena observed in Bolivia become more intelligible. A compound, say, of tin with phosphorus or silicon, on reaching a zone of lower temperature where the combination of hydrogen and fluorine is possible, can readily unite with hydrofluoric acid and form a double salt of phosphorus and tin. This assumption is strengthened by the fact that the minerals apatite and fluorite, rich in phosphorus and fluorine respectively, are nearly always found in the immediate vicinity of tin lodes.

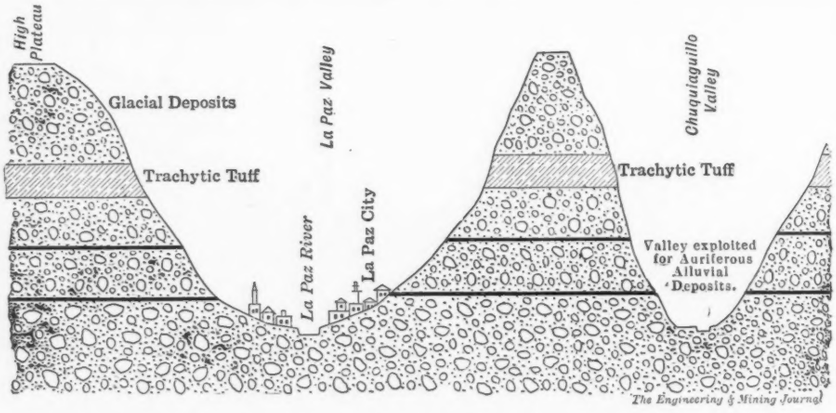
Furthermore, as the gases ascend, they come in contact with water vapors, which, reacting on the double salts, precipitate tin as an oxide (cassiterite), which is deposited along the walls of the fissure. I desire to emphasize the statement, that cassiterite has been precipitated directly from the gaseous state, and also that tin is invariably associated with rocks of great acidity. The gaseous origin of cassiterite deposits has been enunciated admirably by the great geologist Daubrée. I have also found tin associated with acid magmas, rich in minerals of phosphorus and fluorine, notwithstanding Dr. Stelzner's assertion to the contrary as regards Bolivian ores.

In certain deposits in the quartzites of the Andes, at such altitudes as 17,000 ft., the purity of the cassiterite is such (often being practically exempt from all impurities) as to force me to regard with some incredulity the current theories on ore deposition, and particularly those of lateral secretion.

Scrivenor's Theory

Although differing with me as regards the original state of tin under high temperatures and pressures, J. B. Scrivenor, geologist of the Federal Malay States, expounds ably a somewhat similar theory as follows:

"Experience has shown that cassiterite generally has satellites in the form of minerals containing certain elements, prominent among which are fluorine, boron and lithium. The fluorine occurs in topaz and fluorite (and often as a minor constituent of tourmaline and some micas), the boron occurs chiefly in tourmaline but also in axinite, while the lithium is found in mica and sometimes in tourmaline. Kaolin, also, is generally found connected with tin deposits. The association of these minerals with cassiterite and the occurrence of some of them in injections of rock, have led to the assumption that tin, boron, and lithium were extracted from the lower parts of a not yet entirely consolidated granitic magma by hydrofluoric acid, and that the fluorides formed rose through fissures in the cooling mass and passed into the heated older rocks surrounding the igneous rock, strongly attacking and altering the walls of the fissures both in the igneous rock and in the rocks beyond. The chief results of the chemical reactions that took place were the for-



Vertical Cross-section at Right Angles to La Paz Valley, Bolivia

mation of topaz by the action of fluorine on feldpar in granite, the production of tourmaline in the granite, where perhaps it was partly formed by boron combining with already existing brown mica. . . . . The reactions that took place as the igneous rocks cooled were, we may be sure, complicated; but in the main the theory of the origin of tin deposits is that hot gases rose from the bottom of an acid magma, the upper portions of which were already solid and fissured by the contraction due to cooling; that these gases, among which tin fluoride and boron fluoride were prominent (the tin and boron being leached out of the magma by hydrofluoric acid), attacked the walls of the fissures in the acid rock and in the rocks beyond, tin fluoride being decomposed by water vapor to form tin dioxide and hydrofluoric acid, the boron fluoride also being decomposed and the boron released to form tourmaline. Also injections of the magma whence the tin and boron had been originally leached out invaded the upper solid portions of the igneous mass, and sometimes passed into the rocks beyond."

Precipitation From Aqueous Solution

Van Hise's and Sandberger's theories that most of the metallic constituents of ores are derived from igneous rocks through the medium of water under certain special conditions, as enunciated in the former's elaborate article, "Some Principles Controlling the Deposition of Ores," does not satisfactorily explain the deposition of tin; for we know that cassiterite is insoluble even in the most active acids, and I again beg to quote Mr. Scrivenor. ". . . . .The insolubility of cassiterite in acids is well known, and it is not surprising to find that no tin ore deposits are known where it can be proved that the tin dioxide has been derived from some older deposit and thrown from solution, or where there is reason for suspecting that tin has been leached out of the upper portion of the lode and concentrated in depth. There are, however, two cases quoted in literature on ore deposits (they both appear in Weed's translation of Beck's 'Nature of Ore Deposits,' pp. 422 and 423) as showing that the deposition of tin dioxide is possible in nature in a purely aqueous way, and at normal atmospheric pressure. The first is an analysis by Meurier of silicious sinter from Ayer Panas, a hot spring in Malacca. 'Tin oxide' to the amount of 5 per cent. was found and Lindgren, in a well known paper, remarks: 'This observation possesses the greatest importance for our knowledge of tin deposits, as it shows that the metal may be held in solution and deposited at ordinary pressure by thermal waters.' Not so well known is a series of analyses of water from thermal springs in Selangor and Malacca, by Doctor Bott, formerly government analyst at Singapore, published in the *Journal* of the Straits Branch of the Royal Asiatic Society. In the course of this paper, Doctor Bott remarks that the formations in the immediate vicinity of the springs are granitic, and that tin ore in varying, though small quantities, is found disseminated through the mass of some of the specimens. He found no tin in any of his samples of water, and criticised unfavorably Meurier's analysis of the Ayer Panas water. It is unnecessary to reproduce the criticism here, except to point out that it is not shown by Meurier why the tin was deposited as an oxide in the presence of sulphuretted hydrogen, which was found in the water. The other case is familiar to those who have read the literature of Cornish tin deposits. It is that of the deer's horns containing tin dioxide, which is stated to replace pseudomorphously the original horn structure. The horns were found in alluvium, and an analysis of one of them showed 2.6 per cent. of tin dioxide, which it was supposed had been deposited from solution. When serving on the geological survey of Great Britain, I was asked to examine two of these horns, which figured in the mineralogical collections at the British Museum of Natural History. One of the staff (Dr. Prior) had a section cut from one of the horns, and also kindly analyzed fragments for me. In the result no cassiterite was found in the section and no tin was found in the fragments analyzed. The deep coloration of the horn was probably due to iron. The section showed, however, that it would be quite easy for fine particles of tin ore to be lodged in the minute cavities of the broken pieces of horn, while they lay in the bed of a stream, thus giving a certain amount of tin in an analysis. The other specimens, some of which are, I believe, in the Penzance Museum, were not examined. But although it is difficult to accept these two cases as proving the possibility of the solution and redeposition of tin dioxide at ordinary pressure, tin is known to be deposited in mineral springs elsewhere. Posepny, for example, in his 'Genesis of Ore Deposits' gives five analyses of water from hot springs, one at Rippoldsau, another at Kissingen, all showing tin to be present. But the source of this tin was not necessarily cassiterite, nor was it found as cassiterite."

In résumé, it appears quite certain that cassiterite has been deposited directly from a gaseous state, the gases coming in contact with aqueous vapors, and that the deposition took place under great pressure and high temperature. Furthermore, it appears that this deposition was anterior to the other mineral deposits, which unlike the tin formation, had plutonic waters as a carrier. To prove the former, I gave a lengthy description of the Andes, the denudation that took place, and the consequent removal of enormous pressure. I have also shown that the *Cordillera Real* and the tin formations contained therein are much older than the *Cordillera Occidental.* With the later's upheaval, other mineral deposits took place, independently and without any relation with the tin formation. I will now give a somewhat detailed description of the tin deposits and show that the tin formations in Boliva, like those of other countries, are closely related with acid rocks of igneous origin.

Occurrence of Tin Ores

My observations substantiate the fact that tin formations in Bolivia are invariably connected with acid rocks, mostly of the granitic type. Dr. Stelzner's statement that the Bolivian tin ores constitute an exception to the rule, and also his assertion that they are produced simultaneously with precious silver ores, sulphides of copper, zinc, iron or lead, by precipitation from mineral springs, do *not* agree with the facts observed.

The important tin producing regions of Bolivia, extending from Lake Titicaca toward the south are: Huayna-Potosi, Milluni, Araca, Choquetanga, Quimza-Cruz, Santa Vela Cruz, Colquiri, Ocavi, Oruro, Morococala, Huanuni, Uncia, Llallagua, Potosi, etc. In examining the intrusive rocks in all these mines or in their immediate vicinity, we invariably find intrusive acid rocks, as granite, pegmatite, aplite, or microgranulite, etc. For the sake of methodical enumeration, I will begin with the mines situated near Lake Titicaca and describing the formation and the intrusive rocks either directly connected with the tin lodes, or at their vicinity, will proceed toward the south, thus covering a ground of more than 300 km. in length.

Not far from Lake Titicaca, between the glaciers[1] Illampu and Huayna-Potosi (Kaka-aka) is situated the Challana glacier, which is composed of a granitic mass with dikes of pegmatite rich in muscovite and coarse crystals of cassiterite, often of the size of a hazelnut. Sometimes these aggregates of white mica and cassiterite in large crystals predominate to such an extent as to mask the other elements of the rock. On the eastern slopes, toward the Amazon basin, in the same granitic mass, dikes of pegmatite with big crystals of white mica have been found, of such size as to warrant a mica exploitation.

About 25 km. south of Challana the Huayna-Potosi or Kaka-aka glacier is

[1]In this article, "glacier" has the meaning of "snow-covered mountain."

similarly composed of granite with transition to syenite.

Farther south, say 56 km. on a bee line from Kaka-aka is Illimani, one of the highest peaks of the Andes, and in its neighborhood are the Araca gold and tin mines. In Illimani, the eruptive rocks are granite and their transitions into microgranular masses in which are imbeded crystals of plagioclase, quartz retaining traces of crystalline outlines, chlorite, mica, zircon, iron oxide, etc.

Microscopic examination of a specimen from the dike of the Concordia lode, in Santa Vela Cruz, reveals a typical microgranulite with its usual elements, with some pyroxene. The quartz often appears with inclusions.

At Colquiri we find an intrusive rock or a highly decomposed slate, mostly kaolin, containing angular grains of quartz, fluorite, sericite, iron oxide, etc.

The same intrusive rock decomposed *in situ* at Colquiri is also found in Ocavi in Copacabana and No. 1 lodes, while in the Thalia lode the intrusive rock, called by the natives *panizo,* seems to be an aplite. It is often interstratified with the slates, and since in its proximity the tin deposits are rather abundant, it serves the natives as a guide in their search for the lode, and receives another characteristic name, *criadero de estaño,* i.e., tin producer. Microscopic examination by Lacroix of the Museum of Natural History of Paris, shows this rock to be composed of kaolin, granular quartz, iron, etc. Its hardness is medium, whence some engineers mistook it for hardened clay.

In the Oruro district the rocks are mostly rhyolites; these after all can be considered as a passage of microgranites into rhyolites, and as this region is not distant from Colquiri, where only the apophyses of underlying acid rock are seen, the similarity of mineralization in both places cannot but lead to a hypothesis of relationship with a common deep seated magma of acid nature. Going farther south in the Potosi mines, so famous once for their silver production and now so rich in tin, dacites or rhyolites are met. It is well known that dacites and rhyolites are difficult to differentiate from one another. Apatite is not infrequent in this rock.

From the foregoing we clearly see that all the tin-bearing regions of Bolivia are associated with acid rocks, and in the majority of cases granite predominates.

Smelter Settlements and Contracts—I

By Percy E. Barbour*

Graphic representation of ore contracts would clear up many misunderstandings between the shipper and the smelter. It would often enable the former to detect "jokers" and to make a better bargain.

*Mining engineer, Tecoma, Nev.

Much twaddle has been written on the subject of ore settlements and the sharp practices of the smelters in dealing with the ore shippers. The smelter is, unfortunately, generally regarded as a crook and ore settlements are nearly always regarded with suspicion. Now the facts of the case are really simple.

Almost every ore contract is a complicated, intricate instrument and offers a fine opportunity for the inclusion of "the little joker." Comparatively few mining engineers are ever called upon to negotiate an ore contract; while on the other hand the smelter is constantly making such contracts and buying ore on varying schedules. The result is of course apparent. The smelter acquires in the process experience and skill, which are lacking to the ore seller and this naturally operates to the serious disadvantage of the latter when he comes to deal with the former.

Granting then that the ore seller, with, of course, some exceptions, is at a serious disadvantage when negotiating an ore contract with a smelter, is there any way in which this disadvantage can in any measure be overcome? I think there is. I believe that graphic representation of ore contracts is the only way to study them. Any ore contract, however complicated, can be reduced to a series of curves and these curves can be so grouped that inequalities, or jokers, if there are any, put into the contract by the smelter, are readily seen and when once known can be combatted and a better trade made.

Copper Contracts

I am presenting herewith three charts or sets of curves showing graphically what is considered an intricate ore contract, which is now in force between a Utah copper-mining company and a Utah smelter. This contract provides that the amount of copper in the ore shall be computed at one per cent. off the wet assay and shall be paid for at the New York quotations for electrolytic copper, less 2½c. per lb. for refining; a charge of 1 per cent. of the selling price of the copper shall be deducted as a selling commission; the smelting charge shall be $2.30 base; silica shall be penalized at 12c. per unit, and iron shall be paid for at the rate of 10c. per unit. The freight rate from the mine to the smeltery, paid by the shipper, is on a sliding scale, to wit: Ore with a net value, after working charges and all deductions have been taken out, under $10, pays $1.75; value over $10 and under $20 pays $2; over $20 and under $30 pays $2.50 per ton, etc., these three being all that need be considered in this case. The precious metals in this particular ore are so nearly lacking that they are never paid for, so can be here neglected.

Graphs of an Ore Contract

Chart I has three separate sets of straight line curves. The upper set, shown in broken lines, represents the value per ton of the ore with varying percentages of copper and at various New York quotations from 11 to 14c., inclusive. These curves show the total gross value of the copper in the ore. This might well be called the "sucker value" of the ore because the inexperienced man always figures this alone and most of the mining failures are based on these values.

The second or middle set of curves, in dotted lines, shows the value of the ore at the same New York quotations respectively but with the smeltery and refinery charges and the selling commission deducted. Working out these curves will be described below. Right here we have the first revelation for the uninitiated. The deductions, so small in themselves as expressed, do not carry the weight to the cursory examiner that they should. As shown by the chart a 2 per cent. copper ore at 11c. per pound for copper has a gross value of $4.40 per ton while it has a net value after the deductions are made of only $1.68 per ton.

On higher-grade ores the difference is a rapidly increasing one; on 10 per cent. ore for example, the difference is nearly $7. It is not until the real size of these deductions is fully appreciated that the seller can make a contract fair to himself. After the first ore settlement is received is a poor time to realize how large these deductions are, and how large a crimp they are going to put in the mine's estimated profits.

The third or lowest set of curves, shown in full lines, gives the net value of the ore less the working charge of

$2.30 per ton. This set of heavy lines on chart one, therefore, gives the value of the ore after all deductions are made, except for freight, provided the silica and iron offset each other. These latter must be plotted separately.

Bonuses and Penalties

In chart II, the lines sloping upward to the left represent bonuses for iron excesses and the lines sloping upward to the right represent penalties for silica excesses. To read the curves, read up from the line of abscissas at the given per cent. silica to the inclined line giving the per cent. iron in the ore, then read the bonus or penalty from the projection of this point on the left hand scale of dollars. A glance at this chart will tell more impressively the size of this two-cent difference between the bonus for iron and the penalty for silica than is conveyed by the expression "two cents." More especially is this true when a specific instance is considered. The ore to

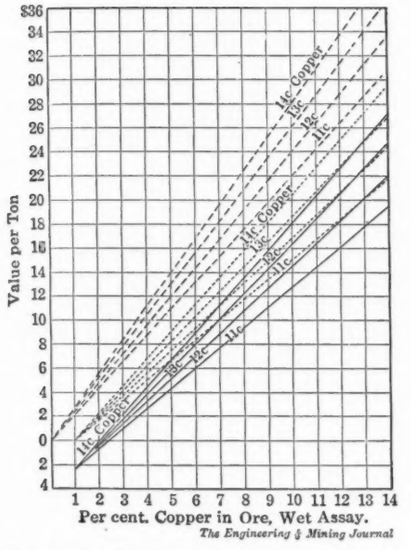


Chart I. Value per Ton of Ore at Different Percentages and Prices of Copper

which this contract applies will ordinarily run 23 per cent. silica and 17 per cent. iron. The penalty here is not the difference between 23 and 17 multiplied by two cents, but is the difference between 23 x 12c. and 17 x 10c., which is read directly from the chart and is $1.06. Here is another case where the smelter knows full well the value of this two-cent difference which more than likely is underestimated by the seller. As a matter of fact the bonus and penalty per unit ought to be the same and generally are and in Salt Lake smelting circles vary from 7 to 12c. per unit with an average of 10. Any such difference as is shown by this contract is apt to be, except in the case of monopoly or lack of competition, a case where the smelter out-traded the seller.

Chart III is plotted from the freight rates as given in the sliding scale but here reduced to dry ore for reasons later to appear. It is impossible to express the contract in question in a single set of curves. But they are well expressed in the three sets as shown and there are numerous advantages in having them thus segregated. Given the assay certificate of any lot of ore, the net proceeds per ton can be quickly determined from the readings of the three charts, thus: the net value at the smelter, from chart I, less the silica penalty, from chart II, or plus the bonus if there be a bonus, less the freight, from chart III.

How to Plot the Curves

Plotting curves is not within the scope of every old prospector who has some ore to sell, but it should be of the engineer and these curves are neither difficult nor laborious to plot. Take the first set of lines in chart I. These must necessarily all start at zero. For convenience in plotting, take a 10 per cent. ore; this contains 200 lb. copper

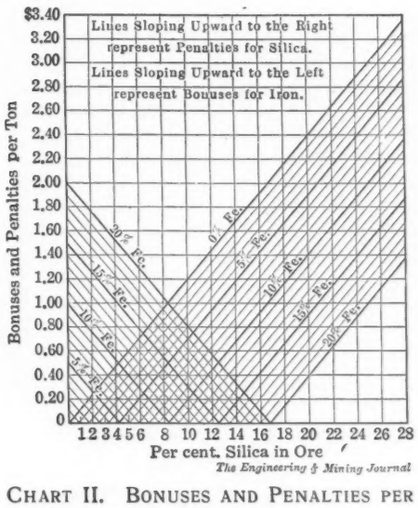

Lines Sloping Upward to the Right represent Penalties for Silica.
Lines Sloping Upward to the Left represent Bonuses for Iron.
Bonuses and Penalties per Ton
Per cent. Silica in Ore
The Engineering & Mining Journal

Chart II. Bonuses and Penalties per Ton for Different Percentages of Iron and Silica

per ton. Every cent added to the quotation for copper adds $2 to the value of this ore per ton, hence it is only necessary to plot $22 for 10 per cent. ore at 11c. and then vertically over it $2 higher up each time for each variation of one cent per pound, and then to draw a line through these points from the origin. Thus each curve is plotted with absolute accuracy by calculating only one point in each curve.

For plotting the second set of curves on chart I a formula must be developed which shall express the terms of the contract.

Let A=the wet copper assay in per cent.; Q=the New York quotation for copper in cents per pound; V=value per ton. Then the pounds of copper paid for are, according to the provisions of the contract, $(A\text{-}1)$ x 2000, and the value per ton at New York quotation is then $2000\ (A\text{-}1)\ Q$. The selling commission is 1 per cent. of this value or, $0.01\ (A\text{-}1)\ (2000\ Q)$. The refining charge per ton at 2½c. per lb. will be $2000\ (A\text{-}1)\ (2½)$. Deducting the selling commission and the refining charges from the value per ton gives the equation:

$$2000\ (A - 1)\ Q - 0.01\ (A - 1)\ (2000\ Q) - 2000\ (A - 1)\ (2½) = V$$

Whence

$$V = 2000\ (A - 1)\ (Q - 0.01\ Q - 2½),$$

or

$$V = 2000\ (A - 1)\ (0.99Q - 2½) \quad (a)$$

From this formula we can now plot the curves. As this is an equation of the first degree, the curves will again be straight lines and we can take a shortcut in plotting as before, by plotting only one point in the curve and drawing a line through the zero point. However, the zero point of dollars in this case will not be the origin but will be where the copper content is 1 per cent. as shown, because when the ore assays but 1 per cent., the

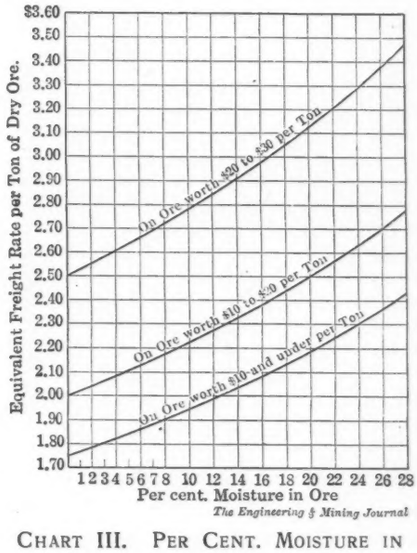

Equivalent Freight Rate per Ton of Dry Ore.
On Ore worth $20 to $30 per Ton.
On Ore worth $10 to $20 per Ton.
On Ore worth $10 and under per Ton.
Per cent. Moisture in Ore
The Engineering & Mining Journal

Chart III. Per Cent. Moisture in Ore with Equivalent Freight Rate per Dry Ton

smelter makes the one-off deduction and there is nothing left.

The third set of lines on chart I is plotted by drawing lines respectively parallel to those of the second set, shown dotted, each point being $2.30 below the corresponding point above. This is so because this set represents the same value of the ore as shown in the second set but with the smelting charge of $2.30 deducted.

Chart II consists of straight lines and very little figuring is required. Starting on the line of ordinates, with silica therefore, zero, and with iron at 10c. per unit, the amounts of the bonuses for various iron assays are obvious; then dividing any of these amounts by 12c., the silica penalty per unit, will give the silica content which will just offset the given amount of iron at 10c., in which case

TABLE I. COPPER SMELTING CONTRACTS

Plant	A	B	C	D	E	F	G	H	I
Gold	$19 per oz. if under 0.5 oz. per ton. $19.50 per oz. if over 0.5 oz. per ton.	All at $20 per oz. if over 0.5 oz. per ton. No payment for less than 0.5 oz.	95 per cent. at $20 per oz.	$19 per oz.	If one ounce or more, $19 per oz.	Gold not paid for in quantities less than 0.5 oz. per ton.			$19 per oz. if 0.02 oz. per ton or over, no payment for less.
Silver	90 per cent. at New York quotation. No payment for less than one ounce per ton.	95 per cent. at New York quotation.	90 per cent. at New York quotation.	90 per cent. at New York quotation.	95 per cent. of New York quotation if one ounce or over per ton.				95 per cent. at New York quotations. No payment for less than one ounce per ton.
Copper	Wet assay, less 1.3, at ENGINEERING AND MINING JOURNAL electrolytic quotation, less 4c.	Full electrolytic assay less 15 lb. copper per ton of ore at ENGINEERING AND MINING JOURNAL electrolytic quotation less 3c.	Wet assay, less 1.3, at ENGINEERING AND MINING JOURNAL quotation for electrolytic, less 3c.	Dry assay or electrolytic, less 1.3, at New York quotation for electrolytic, less 3c.	If 3 per cent. or more pay for 90 per cent. of full wet assay at quotation for electrolytic cathodes, less 3c.	Wet assay, less 1.3, at New York quotations less 2c.	Wet assay, less 1.3, at New York quotations, for electrolytic, less Per Ct. Cu. 5c. if 1.4 to 5 4½c. if 5 to 10 4c. if 10 to 20 3½c. if 20 to 30 3c. if over 30	Wet assay, less 1.0, at New York quotations, less 1 per cent., less 2½c.	Wet assay, less 0.85, at New York quotations for electrolytic cathode, less 2½c
Insoluble	Insoluble, no charge.				Insoluble, all at 10c. per unit penalty.			Insoluble all at 12c. per unit penalty.	Insoluble all at 7c. per unit penalty.
Iron	No payment.				All paid for at 5c. per unit.			All paid for at 10c. per unit.	All paid for at 7c. per unit.
Lime					if over 3 per cent. all at 6c. per unit bonus.		If the silica excess is: (Up to 25 per cent., $7.50 25 to 50 per cent., $8.00		
Arsenic, Antimony and Bismuth	Arsenical and antimonial ores not received.				3 per cent. free, excess at 50c. per unit penalty.		50 to 75 per cent., $8.50 Above 75 per cent., $9.00		
Treatment Charge	$4 per dry ton.	$4 per dry ton.	$4 per ton if ore does not exceed $50 in value, and 25c. per ton additional for every $5 or fraction thereof increase in ore value.	$2 per dry ton.	On 3 per cent. copper 33 base, deduct 10c. per each unit of copper contained in excess of 3 per cent.	$12.50 per dry ton.	Iron oxide ores containing copper, $7. All these per dry ton.	$2.30 per dry ton.	Freight and treatment, $4.25 per ton dry weight (freight $2.00 per wet ton).
Briquetting	For concentrates and fine ores $1 per ton.				$1.50 per ton when any lot contains 25 per cent. passing 4 mesh.				

A, B, C are California smelteries. D is a British Columbia smeltery. E is a Southwestern plant. F is a Northwestern plant. G, H, I are Utah smelteries.

there will be neither bonus nor penalty to be paid. This point on the line of zero dollars just determined connected with the starting point on the line of ordinates gives a line representing bonuses for the excess iron. From this point in the line of zero dollars the line continued will slope upward to the right and here again only one point need be calculated to determine each curve.

In chart III the various freights per ton of dry ore are calculated by dividing the railroad rates by the per cent. of dry ore in a ton of the ore as shipped or by 100 minus the per cent. of moisture. It is evident that if the ore contains 10 per cent. moisture, for example, and the railroad freight is $2 per ton, then the actual cost of freight on the dry ore in a ton as shipped is $2 divided by 0.90. If this be expressed in a formula the equation will be found to have a negative exponent. It is therefore not an equation of the first degree and cannot be represented by straight lines. In this case each point will have to be calculated to give the proper curve. These values are easily read from a slide rule so that the labor involved is practically nil.

Settlement Sheet Explained

Accompanying is also presented a smeltery settlement sheet for a lot of ore settled for under this contract in question. The smelter has a short way of figuring these things which is difficult for the ordinary shipper to grasp and because the smelter is nearly always looked upon with suspicious eyes the shipper grasps his settlement sheet, wrathfully proceeds to the smelter and demands to be shown. The fact that he is shown and goes away convinced does not wholly destroy the psychological effect of the first suspicion. I believe it would tend toward much more amicability between the two if the smelter would try to make his settlement sheets plainer to the shipper rather than more convenient to himself. It would allay much of the suspicion which now attends the transaction. To the case in point.

The contract calls for one off the wet copper assay; the settlement sheet shows 1 per cent. off the New York quotation. The contract calls for a selling commission of 1 per cent. on the selling price of the copper product; the settlement sheet, under the heading "Value per Ton," gives "Copper Less 1 per cent., $1.876." There is no evidence on the settlement sheet of the deduction of 2½c. for refining as provided in the contract. The only way to check this up is to figure backward. If 1 per cent. equals $1.876 then 100 per cent. will be $187.60 per ton which is equivalent to $0.0938 per lb. The New York quotation of 12c. less 1 per cent. amounts to 11.88c. The difference between this and the 9.38c. per lb. just determined is 2½c. which is equal to

the refining charge, which evidently has been deducted. By working forward, it can be found that the agreement is not a mere coincidence, but that a quick method of calculation is used by the smeltery.

Determining Shipping Ore

The charts just described are of as much utility to the shipper after the contract is in force as they are of value to the seller in studying the intricacies of the contract before it is signed. The lower set of curves on chart one tells at a glance what the copper tenor of a shipment must be just to pay expenses. To do this read up the scale of ordinates to the amount which equals the freight per ton plus the silica penalty, project to the right to the solid line representing the proper quotation for copper and then vertically down to the copper assay at the bottom. The assay of the ore which will just carry itself is a factor too often neglected by the mine foreman or superintendent.

It is common practice to allow low-grade ore to be mixed with better grade just so the average tenor is up to requirements. But any ore shipped which will not carry itself causes a distinct loss and mixing it in is a stupid blunder. Mixing low-grade ore with rich ore does not make the poor ore any better or more profitable and it robs the rich ore of a portion of the profit which might have been made on it. Then too, while the average may still be of profitable grade there is money lost on the lowering of the average grade. Take the contract we have just been discussing; the smelter takes one off wet copper; if the ore assays 4 per cent. copper the smelter's one off amounts to one-quarter of the total copper content; if the ore assays 8 per cent. the one off is equivalent to one-eighth of the total copper content. So that mixing low-grade ore with high-grade shows a loss whichever way it is viewed.

There is an apparent exception to this statement, however. There are cases where the silica penalties are so high on rich ore that an ore high in iron though lower in copper can be mixed to advantage with the other ore and while the losses on the copper still pertain, the saving of penalties may more than offset them.

The ores from the mine shipping under the above contract contain more moisture than any other run-of-mine ore I know. Ordinary shipments average from 14 to 21 per cent. moisture and some shipments have averaged over 30 per cent. By referring to chart III it can readily be seen what this excessive moisture entails upon the shipper in the way of increased freight per ton of dry ore. On a $2 railroad freight rate the actual cost of freight per dry ton on an ore with 20 per cent. moisture is $2.50. In other words, 50c. freight is paid on the water contained per ton. In this particular case it would probably pay to install a drier and dry all the ores before shipment. In discussing the advisability of this drier installation this chart would be of great assistance.

(SETTLEMENT SHEET—COPPER SMELTING CO.)

Salt Lake City, Utah, 5–4–11.

Bought of.....

Mine.....Lot No. 257.....Class *Crude*

Sampled by *Copper Sm. Co.* Received.....Assayed.....

Quotations of 4–26–11 Silver.....Copper 0.12—less 1 per cent.

ASSAYS	Gold, Oz. per Ton	Silver, Oz. per Ton	Copper, Per Cent.	Insol., Per Cent.	Zinc, Per Cent.	Sulphur, Per Cent.	Arsenic, Per Cent.	Iron, Per Cent.	
Copper Sm. Co.		0.1	7.16	17.4				14.5	
Re				17.6					
Mine.....			7.07	19.5				15.2	
Re				18.8					
Umpire *Currie*				19.4					
Settlement									
Assay.....			7.115	18.8				14.85	

Weights	Values per Ton		Treatment	
.....	Gold.....@.....	.....	Base.....	2.30
.....	Silver....%.....@.....	.....	.....	.....
.....	Copper, less 1%, @ 1.876	11.471	Insoluble.....	2.256
.....	.....	.....	Zinc.....	.....
.....	Total value.....	11.471	Sulphur.....	.....
Weight of lot.....	.....	.....	Arsenic.....	.....
Less weight of....sacks.....	.....	.....	.....	.....
Wet Weight 149660	.....	.....	Debit.....	
Less moisture, 14.3% 21401	Less treatment.....	3.071	Iron.....	4.556
			Net treatment.....	1.485
				3.071

Dry weight 128259 @8.40 per ton =.....$538.69

.....Freight advanced, @ 2.00..... 149.66

.....Advances.....

.....Umpre.....

Correct.....Assays.....

Checked.....Sampling, etc.....

Net proceeds.....$389.03

Payment for Gold in Copper Ore

This brings me naturally to a discussion of the terms of copper contracts in general. Table I gives the smelting contracts of various smelteries applying to copper ores offered to the custom market. The term unit, used perhaps more in lead and zinc contracts than in copper, means in all cases 1 per cent. per ton or 20 lbs. Thus an ore containing 10 units of iron is equivalent to saying an ore which assays 10 per cent. iron.

The gold in an ore is generally paid for at $19 per ounce if there is 0.05 oz. or over per ton. For less than this amount no payment usually is made. However, table I shows various other terms of settlement for gold. The smelters generally sell their gold to the mint, if they have their own refineries, at $20.67 per oz. and sometimes get the same from the refiners. The difference, $1.67, is a little melon for themselves. Of course it costs something to recover the gold in the copper-refining process but nothing like $1.67 per oz. and anyway that cost is covered in the deduction made for the refining of the copper itself. The ore seller who does not put up a fight for more than $19 per oz. for his gold is not making a good fight.

Settlements for Copper

A deduction is always made from the wet assay of copper. This represents, according to the smelter, the difference between results of the wet assay and the actual recovery of copper in the smelting furnaces. This deduction is generally 1.3. This is the point on which the copper smelters' good faith is perhaps most open to attack. If an ore assays 2.6 per cent. copper and the smelter takes off 1.3 then he takes 50 per cent. of the total copper content for which he pays nothing. His actual smelting loss cannot be over 5 per cent. of the actual copper content if his smelting practice is at all good. Therefore, in this case 45 per cent. of the copper content of the ore goes to the smelter as a perquisite. As stated above the higher the grade of the ore the smaller the percentage of the total does this deduction amount to. As seen from the table 1.3 is the usual but not universal deduction and with a greater keenness on the part of the ore seller the smelter could be traded down on this point to a reasonably fair figure. To be perfectly fair this deduction should be, but rarely is, figured at an agreed percentage of the actual copper contained.

The other usual deduction is a certain number of cents deducted from the New York quotation for copper, varying from two to six cents, depending upon circumstances, to cover the cost of refining the copper. In the case of smeltery *G* in the table, this deduction varies from 5c. on copper averaging 5 per cent. and under to 3c. on ore averaging 30 per cent. cop-

per and over. This sliding scale is solely a device for deluding the ore seller. The purpose of this deduction is to cover freight on blister copper from the smeltery to the eastern refinery, refining charges, and selling expenses, which latter include the actual selling commission and the Eastern office expenses. It is perfectly obvious that the grade of the copper ore purchased or smelted has nothing whatever to do with this item known collectively and briefly as selling expense, so that there is no reason for a sliding scale. This item of selling expense varies largely and while the top limit is at the option of the smelter the bottom limit is not, because it depends upon what the refiner charges the smelter for his services. Table II, giving a list of the Eastern and selling expenses of some of the different companies, is illuminative.

TABLE II

Name	Selling Expenses, c. per lb.	E. & M. J. Reference
Mohawk	0.899	Apr. 15, 1911
Tennessee	1.19	Apr. 20, 1907
Black Warrior	2.5	Apr. 29, 1911
Utah Con. (Highland Boy)	1.92	Apr. 16, 1910
Superior & Pittsburg	1.3	Apr. 16, 1910
Calumet & Arizona	1.31	Apr. 16, 1910
Shannon	1.55	Feb. 12, 1910
Old Dominion	1.05	June 5, 1905
Nevada Consolidated	1.7	Nov. 5, 1910
Bingham Consolidated	2.561	
Anaconda	1.341	May 20, 1911
Cananea	1.7105	June 24, 1911

The Bingham Consolidated contract with the refinery for refining and selling its copper bullion was a case of a hard bargain for the smelting company. The freight on blister copper from Utah to the Perth Amboy refinery was $10 per ton. The refining charge was $17.50 per ton. A deduction of 2 per cent. was made from the silver content and of 1.3 from the copper assay to cover refining losses. A selling commission of 2½ per cent. was charged on the actual selling price of the silver and copper. Gold was paid for on the full assay at $20 per oz. In the first place $17.50 was an excessive charge for refining, although the refiner is entitled to all he can get. The selling commission was just 2½ times as much as the same refiner charged the American Smelting and Refining Company[1] and is now charging other smaller companies for the same service. The deduction of 1.3 is unusual on blister copper, and was a case where the smelter was hoist by his own petard. The gold should also have been paid for at $20.67 per oz.

This contract figures out as follows on Bingham bullion, which averaged for 1903, 6.15 oz. gold; 246.43 oz. silver; and 98.5 per cent. copper. The silver deduction of 2 per cent. at the average price for silver for 1903, which was 52.57c., amounts to $2.59 per ton of bullion. The copper deduction of 1.3 equals 26 lb. per ton which at the then prevailing price of copper, 13.15c., amounts to $3.42. The total value of the silver and copper paid for per ton of blister at the above quotations was $382.49 and the 2½ per cent. selling commission amounts to $9.56. Summarized these deductions are: Freight, $10; refining, $17.50; silver deduction (2 per cent.), $2.59; copper deduction (1.3), $3.42; selling commission, $9.56; total, $43.07. This divided by the number of pounds of copper in a ton of blister as shipped, 1970 lb., gives 2.186c. per lb. To this should be added about ⅜c. in this specific instance for the Eastern office expense of the mining company, making the total cost of Eastern and selling expense 2.561c. per lb. of copper.

One of the large items in the Eastern office expense is the cost of carrying the copper. From the time the blister copper is shipped from Utah until it is refined and sold in New York an average of 105 days elapse. Interest on the cost of the copper for this period is a considerable amount.

Cathode Copper Costs Less

Contracts *E* and *I* contain jokers regarding the quotation used in paying for the copper content of the ores. The usual quotation given on electrolytic copper is for "cakes, ingots and wirebars".[2] When the customer takes his copper in the form of cathodes, which saves the refiner melting it down in the refined form and pouring it into cakes, ingots or wirebars, he is allowed ⅛c. on the quotation. Therefore the price of cathodes is always ⅛c. under the proper New York quotation for electrolytic copper. Comparatively little copper is sold in the form of cathodes. The insertion of the word cathode in the contract above is simply a case of "putting one over on" the seller to the extent of ⅛c. per lb., because few ore sellers are familiar with the differences in the grading of the refined product.

The California smelters mentioned in the table treat the heavy sulphide ores of Shasta county and are glad to get siliceous ores for flux hence they make no charge for the silica in custom ores. The strangest item in table I is the treatment charge at plant *I*. In this case the "treatment charge including freight" is $4.25 per ton of dry ore. In effect the smelter here undertakes to pay the freight on all the moisture in the ore, which as we have seen from chart III on a $2 freight rate may amount to nearly a dollar per ton. There are several ways of explaining this unusual arrangement. The smelter may have overlooked the point or it may be a sop to the seller to offset the cathode quotation used in settlement. Suffice it here to call attention to the point.

Specify Silica by Fusion

The seller should see to it that the contract is explicit regarding silica and insoluble and the penalties therefor, because the ordinary insoluble determination of the smelter is not always a true measure of the silica in the sample. By the wet method generally used some combinations of other minerals with the silica in the ore may not be broken up by the acid treatment and the final result may indicate more silica than the ore actually contains. To obviate this the contract should specify that the silica shall be obtained by fusion, which is the method the smelter will employ if he wants to know, for some metallurgical calculation, exactly what the silica content is. Alumina is part of the insoluble but it should be determined separately and if penalized the contract should be specific on the point. Here is another point on which the seller can trade to advantage if he has his case well in hand. Alumina is not always a deterrent in smelting and should not always be penalized. Smith has shown[3] when and how alumina acts sometimes as a base and sometimes as an acid. Under some circumstances it might in moderate amounts be an advantage in the smelting mixture. The word insoluble should be avoided in the contract. It is an indefinite term with the advantage of the indefiniteness in favor of the smelter.

Lime Should be a Credit

Lime is rarely paid for in copper ores but this, too, is because the ore seller does not get all that is coming to him. Where the silica is penalized and the iron is paid a bonus, lime, too, should be paid for by the smelter. Iron in the ore has two functions in the smelting operation; it is necessary to form matte and it is needed to flux the silica to slag. The lime is equally efficacious in fluxing silica, and lime in the smelting mixture makes an easy-running slag. Most smelters in the West add barren limestone to the smelting charge and are glad to get ores carrying limestone for which they do not have to pay. When the ore seller's education is complete he will demand and receive payment for the lime which his ores contain.

The ore seller or shipper should always have a representative, or inspector, at the smeltery to watch the sampling of his ores and to receive the duplicate pulp which should always be assayed by an outside assayer representing the shipper. If this outside assay checks with the smelter within the following limits, copper 0.5 per cent.; silver 0.5 oz.; gold 0.05 oz.; the ore is settled for on the average of the two assays. If, however, they do not check within these so called splitting limits, the sample should be rerun and then in case of disagreement the third pulp should be given to an umpire.

(To be concluded.)

[1] Eng. and Min. Journ., Jan. 21, 1911.

[2] See page 335, this issue of the Journal.

[3] Eng. and Min. Journ., Dec. 24, 1910.

Plant of Bailey-Wood Coal Company

By Henry D. Jackson*

Description of a West Virginia power plant of small capacity but up to date design. Fan is steam driven so as not to be affected by shut down of generator.

*Consulting engineer, 88 Broad street, Boston, Mass.

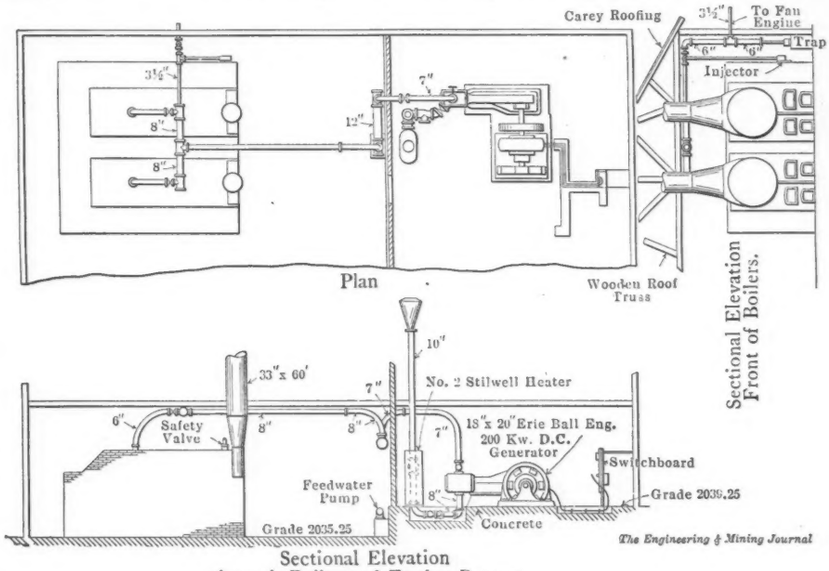
One of the latest power plants in the coalfields is that of the Bailey-Wood Coal Company, at Woodbay, W. Va. This firm has under lease over 2000 acres of New River coal, and is operating in the Beckley seam, between 5½ and 6 ft. thick in this vicinity. The analyses of samples of of this coal, taken from different sections of the mine, give the following results: Sample No. 1, coal as received, 15,109 B.t.u.; No. 2, 14,812 B.t.u.; No. 3, 15,056 B.t.u. During the early development of the territory, haulage was done by mules, but it is expected to haul all the coal with electric locomotives from the sidings to the tipple, and to use electric gathering locomotives to bring coal from the rooms to the sidings.

The power house itself is conveniently located on a spur track of the Virginian Railway, so that the materials in the form of supplies and repair parts can be unloaded immediately at its doors. This spur track is a continuation of the loading tracks at the tipple. The tramroad from the main entry of the mine to the tipple passes directly by the power house at a considerable elevation above it, so that coal can conveniently be unloaded through a chute directly into the coal pocket at the power station.

Terrace Construction Used

The power house is a wooden frame structure, divided into an engine room 32x40 ft. and a boiler room 48x40 ft. The grade of the boiler room is 4 ft. below that of the engine room, this arrangement being made to reduce the excavation, to allow the exhaust piping to be below the floor of the engine room and to allow the heater to be placed well above the feed pump so as to flood it and at the same time have the pump elevated to a convenient hight for operating it. The building foundations are of stone 16 in. thick, carried to a firm footing. A stone wall of the same general dimensions extends across the building, dividing it between engine room and boiler room. The outside walls of the building are covered with corrugated iron, as is also the partition wall between boiler and engine room on the boiler-room side. The inside walls of the engine room are covered with asbestos wood as a protection against fire, also for warmth and general appearance. The roof is protected by Carey roofing.

The boilers are set with the fire doors facing the engine room, so as to allow the engineer also to act as fireman. The two boilers were built to specifications by the Houston, Stanwood & Gamble Company, of Cincinnati, and are of standard horizontal return-tube type, 78-in. diameter and 20 ft. long, with flush fronts. Each boiler has one hundred and fourteen 3½-in. tubes 20 ft. long, and is rated at 210 h.p. The shell and heads are of open-hearth steel 9/16-in. thick. Each boiler is provided with two manholes, one in the middle course on top, the other in front head below the tubes. The boilers are supported by structural-steel frames so that none of the weight comes on the setting, and are set on concrete foundations. Each boiler has its own stack, 33 in. in diameter and 60 ft. high, made one-half of 3/16-in. and one-half of ¼-in. steel plate. The boilers are designed for a working pressure of 150 lb., and were tested to be tight under a hydraulic pressure of 225 lb. Each boiler is fitted with two 3½-in. Ashton pop safety valves and Williams combined feed-water regulator water column and high-and-low water alarm.



Sectional Elevation through Boiler and Engine Rooms.

Power Plant, Bailey-Wood Coal Company

Layout Designed for Future Extension

The main engine is an 18x20 horizontal side crank, Erie Ball with corliss-type valves. It operates at 200 r.p.m., with rating of 320 h.p., with steam at 125 lb. This engine is provided with forced-feed lubrication. The engine is direct-connected to a General Electric direct-current generator, having a capacity of 200 k.w. The machine is compounded from 250 volts no load to 275 volts full load. The exhaust of the engine is free through a Swartwout exhaust head, and is piped to a no-thoroughfare heater of the Stillwell type, with capacity of 600 h.p., the heater being made large enough to accommodate the ultimate size of the plant.

A two-panel switchboard is provided, a generator panel and a feeder panel, allowance being made for a future generator panel. The feeder panel is divided into three circuits, the main or power circuit being provided with a special-type breaker having a minimum capacity sufficient to protect the single unit at present installed and the maximum capacity sufficient to carry the ultimate generating capacity of the plant.

The piping is characterized by directness and simplicity, every precaution, however, being taken to avoid expansion troubles and to prevent water from the boilers reaching the engine. A 6-in. main is carried from each boiler to an 8-in. header, from the center of which an 8-in. main is carried to a 12-in. header. At one end of this header is a tee, from which a 7-in. main is carried to the engine. From the other end, steam is carried direct to a feed-water pump and the header is also dripped through a trap. This arrangement of piping allows the thorough draining of the water from the steam and also allows plenty of flexibility. It is intended that this 12-in. header shall be extended eventually to take care of another engine similar to the one now installed, also a small lighting unit which will go between the two main engines, and provision is also made for an additional boiler. The 8-in. header over the

boilers is extended toward the side wall, as shown, to furnish steam for an injector and also for a fan engine located about 400 ft. away from the main power house. As this fan engine is about 50 ft. higher than the boilers, provision is made for possible condensation in the pipe line by means of a vertical 6-in. pipe, the steam line to the fan being taken from a tee midway on this pipe, and this pipe dripped through a trap.

Water Supply System

Water for the plant is provided by means of an electrically driven triplex pump located near the creek, this pump forcing the water to a wooden tank of approximately 40,000 gal. capacity, the tank being the standard underwriters' type, 20 ft. in diameter, 17 ft. 4 in. high, made of 3-in. material thoroughly banded with round-iron bands. The tank is supported on four concrete piers or walls, on top of which are a number of 10x12 timbers supporting the 4x12 members underneath the tank, these latter spaced 18 in., giving a thoroughly firm support for the tank. Water is supplied to the boiler room by gravity through a 3½-in. pipe from this tank. The pump is provided with a no-voltage release-starting rheostat, so that in case of failure of the electrical supply, the pump will shut down and will not start until a man is sent to start it. Water is supplied to the boilers by means of the injector before mentioned, and also by means of a 6x4x6 horizontal duplex-piston Warren pump, the suction of which is connected so as to draw either from the heater or the cold-water supply. Steam to this pump is controlled through a Williams pump governor.

A steam-driven fan is located at the mouth of the airway, the fan being direct connected to an Erie Ball 11x16 horizontal, side-crank, single-valve engine, provided with a hand-adjustable cutoff, so devised that the fan can be operated at any speed desired to accommodate the requirements of the mine and can instantly be speeded up to its maximum speed in case of emergency. A throttling governor is also provided, to prevent the engine from running away in case of accident to the fan. The two shafts, engine and fan, are separate, being fastened together by means of a solid flanged coupling, so that, in case of accident, repairs can be made to either without the total dismantling.

The fan was furnished by the Jeffrey Manufacturing Company, is 10 in. in diameter by 3 ft. 6 in wide, and is rated to deliver 100,000 cu.ft. of air per min. at 3-in. water gage when operating at a speed of 190 r.p.m.., and requires approximately 60 h.p. This fan is primarily used as an exhauster, but in case it is desired, the discharge can be closed, the door at the end of the air chamber opened and the fan used for blowing. The connection to the airway is so arranged that the door is amply protected against explosion; but the door closing the air inlet is lightly latched and would be blown open in such contingency, so that all that would be required to operate the fan as a blower would be to close the door in the exhaust stack and swing over the door in the airway. Steam was chosen for operating this fan because it was deemed necessary to run it when the main unit is shut down. It will be noted that the piping is firmly anchored just outside the engine-room wall, and that the same provision is made here for protecting the engine from water as was made at the boiler plant to protect the headers. The piping in the main plant, with the exception of the flanges, is covered with H. W. Johns-Manville Company's asbestos covering, and the entire line to the fan, including flanges, is covered with a double standard thickness of the same material, with broken joints.

Electric Power for the Transvaal

By Frederick H. Hatch

One of the most remarkable economic changes on the Rand is now being brought about by the concentration of the steaming plant at two or three centers, from which power is distributed to the mines by electric transmission, or in the form of compressed air. This has largely been the work of the Victoria Falls & Transvaal Power Company, although one or two of the mining groups, notably the Farrar and the Robinson, have established their own power stations. Electric power is rapidly supplanting independent steam power for mills, hoisters, sinking engines, underground hoists, pumping etc., owing to the favorable rate at which it can be purchased from the power company. The price has been fixed by agreement at 0.561d. per unit until October, 1912, and thereafter at 0.525d. The company has already in operation three central generating stations, viz., at Rosherville (50,000 kw.), at Simmer Pan (18,000 kw.) and at Brakpan (9000 kw.); and a fourth station is in course of erection at Vereeniging (20,000 kw.). Stations have also been erected by the Farrar and Robinson groups at Kleinfontein (6000 kw.), East Rand Proprietary mines and at Randfontein. (20,000 kw.). At all these stations the power is generated by steam turbine . Transmission is effected both by overhead lines (at 40,000 volts along the Rand, and at 80,000 volts from Vereeniging, a distance of 30 miles) and by underground cables (at 20,000 volts). The length of the overhead lines, including Vereeniging is 150 miles; that of the underground cables 35 miles.

Note—Extract from the "James Forrest" lecture, 1911, before the Institution of Civil Engineers, entitled "The Past, Present and Future of the Gold Mining Industry of the Witwatersrand, Transvaal."

A portion of the power supplied by the company is in the form of compressed air for rock drills. For this, there is a supplementary station at Rosherville, generating 16,000 h.p. by four compressors driven by steam turbines, and an electrically operated station at the Robinson Central Deep mine, delivering 24,000 h.p. from six compressors. The compressed air is conveyed through 20 miles of air mains, ranging in diameter from 26 to 9 in., the pressure of supply being 120 lb. per square inch.

Economies Introduced

A considerable economy will be effected by this centralization of power generation, and the consequent reduction in the number of independent steaming plants. From the price per unit at which the Victoria Falls & Transvaal Company is supplying power, the cost of a horsepower per annum, utilized continuously day and night, can be calculated to be £14. It is not so easy to arrive at the average cost of a horsepower-year at the mines prior to electrification, but it is stated to have been £28. In any case, the saving due to the substitution of electric motive power for steam power is undoubted, and there is, moreover, the indirect advantage of greater flexibility and more perfect control.

The introduction of electric hoisters on the Rand has practically decided the long-debated question of hoisting from great depths, in favor of stage winding, as against a single lift. By the adoption of a large unit of hauling and a suitable arrangement of loading pockets, the loss, due to the repeated handling of the ore, can be reduced to a minimum.

In the new seven-compartment shaft of the Crown mines the ore is to be raised in eight-ton skips. Even greater units have been adopted at Kimberley, as, for instance, at the Wesselton, Bulfontein and Dutoitspan mines, where 11-ton skips are in use. Underground electric hoists, to serve the inclines from the bottom of the vertical shafts, are being installed in several mines, as at the Catlin and Howard shafts of the Jupiter mine. They will also be employed for hoisting in the deeper vertical shafts, when the depth reached is beyond the economic limit of a single lift.

Transvaal 1910 Mineral Output

The Transvaal mineral output for 1910 was as follows, according to the Transvaal Chamber of Mines report for 1910: Gold, 68,291,928 oz.; diamonds, 2,090,068 carats ($6,404,095); coal, 3,970,069 tons; tin ore, 3,383 tons; copper ore, 3,181 tons; silver, 823,752 oz. The dividends paid in 1910 by the Witwatersrand gold mines amounted to $43,191,719 and by gold mines in outside districts, $1,184,737 more.

Alaskan Developments

SPECIAL CORRESPONDENCE

The mineral tonnage which is now being shipped from Prince William sound has reached such proportions that it has necessitated the placing in service of two steel freight steamships for the exclusive purpose of handling it. While at present there are but three large shippers contributing to this tonnage, there are expectations that before the present summer has ended several other properties will have started shipments.

The mines that are now shipping are the Bonanza mine, at Kennecott, the ore of which is brought down on the Copper River railroad and shipped from Cordova; the Beatson Bonanza, situated on Latouche island; and the Ellamar Mining company, situated at Ellamar. From the ore that is blocked out at present on these properties, and from the quantity which is estimated as available for future use, it is expected that all three will remain regular shippers for a number of years to come. The ore from the Bonanza mine is of high grade, but the Ellamar and Beatson properties are both low-grade mines, as is generally the case with copper mines on Prince William sound.

Among properties which are expected to become shippers during the present summer are the Dickey, in Landlock bay, and the Fidalgo Bay Copper Company. Two other properties are in process of development on Latouche island, the Latouche, Ltd., Mining Company, operating on the eastern side of the island, in charge of J. A. Murphy, and the other, situated three miles north of the Beatson property.

Sale of Le Roi Mine

VICTORIA CORRESPONDENCE

At a meeting of shareholders of the Le Roi Mining Company, Ltd., held in London on July 14, the provisional sale of the company's mine and other assets at Rossland, B. C., made last May by A. J. McMillan, liquidator, to the Consolidated Mining and Smelting Company of Canada, Ltd., for the sum of $250,000 was ratified. The property included in the transaction consists of the Le Roi mine and mineral claims adjacent thereto, owned by the Le Roi company, also the machinery, plant, ore dumps, water rights and real estate, comprising the remaining Canadian assets of the company. Cash on hand and accounts receivable as of May 31, 1911, remain the property of the Le Roi company, as do also the smeltery at Northport, Wash., and assets connected therewith.

The terms of sale of the Rossland property are as follows: The sum of $25,000 is payable on receipt by the Consolidated company of cabled advice of ratification of the sale by the meeting of the Le Roi shareholders; upon acceptance of title by purchaser, a further payment of $100,000; at expiration of one year from date of ratification, the balance of $125,000 and interest on the latter amount at the rate of 5 per cent. per annum is to be paid. The purchaser has the option of making final payment at any time after acceptance of title, and only interest accrued to date of such payment is payable in addition to balance of principal. The Consolidated company is now in possession of the property at Rossland.

The Le Roi group adjoins the Consolidated Company's Centre Star group, and underground connection between the two mines already exists. There is known to be a large tonnage of low-grade ore in the Le Roi, but explorations with the diamond drill during the last year or two did not result in the finding of new shoots of ore of sufficiently high grade to leave a margin of profit after payment of all management as well as mining and smelting expenses. As management charges will now be distributed over several properties instead of only one, it is to be expected that costs will be low enough to leave the Consolidated company a margin of profit that was not possible while the Le Roi was worked as a separate mine.

Pig Iron Production in 1911

The production of pig iron in the United States in the first half of 1911, as collected and reported by the American Iron and Steel Association, was less by 659,033 tons than that in the second half of 1910; and by 3,312,942 tons than in the first half. The make for the half-year was the smallest reported since the first half of 1909. The total production, classified according to the uses for which the iron was intended, is given below, in long tons; comparison being made with the first half of 1910:

	1910	1911	Changes
Foundry and forge	3,360,313	2,787,443	D. 572,870
Bessemer	6,323,883	4,704,424	D. 1,619,459
Basic	4,943,942	3,935,487	D. 1,008,455
Charcoal iron	219,653	160,847	D. 58,806
Spiegel and ferro.	130,947	77,595	D. 53,352
Total	14,978,738	11,665,796	D. 3,312,942

The bessemer total includes this year 81,713 tons of special low-phosphorus iron. In the charcoal-iron production a few tons made in the electric furnace are included. The production of spiegeleisen was 43,429 tons; of ferromanganese, 34,166 tons.

PRODUCTION BY FUEL USED

The classification according to fuel used, in the first half of 1911, was as follows, compared with the first half of 1910:

	1910		1911	
Fuel Used	Tons	PerCt.	Tons	PerCt.
Coke	14,382,346	96.0	11,355,722	97.3
Anthracite and coke	371,957	2.5	140,496	1.2
Anthracite alone	4,782	...	8,731	0.1
Charcoal	219,653	1.5	160,847	1.4
Total	14,978,738	100.0	11,665,796	100.0

Only two or three furnaces use raw bituminous coal; they are included with the coke furnaces. As shown in the table, nearly all the so called anthracite stacks use some proportion of coke mixed with the anthracite.

PRODUCTION BY STATES

The production by States was as follows, comparison being again made with the first half of 1910:

	1910	1911	Changes
Mass. & Conn.	7,505	6,424	D. 1,081
New York	1,017,951	833,467	D. 184,484
New Jersey	155,087	39,277	D. 115,810
Pennsylvania	6,065,688	4,822,832	D. 1,242,856
Maryland	170,708	131,531	D. 39,177
Virginia	244,275	159,996	D. 84,279
Georgia & Texas	6,725	.....	D. 6,725
Alabama	1,012,545	809,795	D. 202,750
W. Virginia	137,439	130,455	D. 6,984
Kentucky	46,520	46,493	D. 27
Tennessee	235,969	165,722	D. 70,247
Ohio	3,210,562	2,740,142	D. 470,420
Illinois	1,552,160	882,807	D. 669,353
Ind. & Michigan	716,832	552,056	D. 164,776
Wis. & Minnesota	170,814	147,477	D. 23,337
West of Mo. River	227,958	197,322	D. 30,636
Total	17,978,738	11,665,796	D. 3,312,942

This year Pennsylvania made 41.3 per cent. of the total; Ohio, 23.5; Illinois, 7.6; New York, 7.1; Alabama, 6.9; Indiana and Michigan, 4.7 per cent. No other State reported over 500,000 tons.

CONDITION OF BLAST FURNACES

The whole number of furnaces in blast on June 30, 1911, was 212, against 206 on Dec. 31 1910, and 293 on June 30, 1910. The number of furnaces idle, including furnaces being rebuilt, on June 30, 1911, was 260, against 268 on Dec. 31, 1910, and 180 on June 30, 1910. During the first six months of 1911 the number of furnaces actually in blast during a part or the whole of the period was 296, against 332 in the last half of 1910 and 374 in the first half of that year.

On June 30, 1911, there were 14 entirely new furnaces in course of construction, all of which will use mineral fuel, as follows: New York, 2; Pennsylvania, 6; Ohio, 1; Indiana, 1; Illinois, 2; and Minnesota, 2. One experimental "step" furnace was also being built in Michigan. In addition, one furnace in Virginia was partly erected, but work had been suspended for several years.

On June 30, 1911, six old furnaces were being rebuilt, all mineral fuel, as follows: Two in Alabama, one each in New Jersey, Maryland, Virginia and Ohio.

New Camp Bird Stock

To provide the funds necessary for the redemption of the existing £500,000 of debenture stock and to free the company's property from mortgage, the Camp Bird, Ltd., is offering for subscription 650,000 7-per cent. cumulative, participating, preference shares at par, £1. The balance of the authorized issue, or 100,000 shares, is held in reserve. Ordinary shareholders have preference to the extent of one of the new shares for every four ordinary shares held, as shown by the books on July 24.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. Parke Channing is in Michigan.

Pope Yeatman has returned to New York.

L. A. Parsons, of El Paso, Texas, is in New York.

Edward R. Zalinski, of Salt Lake City, Utah, has gone to Pioche, Nev., on professional business.

Frank H. Probert has been making an examination of the Begoles Mines Syndicate at Goldfield, Nevada.

S. M. Greenidge, of Cananea, Mexico, is in New York on his return to Mexico after three months spent in London and Paris.

A Bewick-Moreing party, comprising Sir William Bell, Graham Prentice, E. C. Moreing, J. L. Loring and G. Lovell, has arrived at Porcupine, Ontario.

J. R. Finlay, who has been appraising the mines of Michigan in behalf of the State, expects to return to New York soon after Aug. 10.

Ernest Hibbert, of Greenwood, B. C., superintendent of mines for the British Columbia Copper Company, was in Spokane, Wash., last month.

L. Reyersbach, accompanied by Hugh Marriott, consulting engineer for Eckstein & Co., of London, is in Toronto. They will later visit Porcupine.

W. K. MacNeil is visiting Cobalt and Porcupine, to collect specimens for the Ontario Department of Mines to be used at the National Exhibition at Toronto.

Dr. A. P. Coleman is in the Sudbury nickel district in Ontario, engaged on a new map of the district which the Canadian government will soon mine.

W. Yolen Williams, of Spokane, Wash., has been visiting mines in Whitehorse copper camp, southern Yukon, in the interests of the Granby Consolidated company.

Doctor Bancroft, of McGill University, with a party of engineers has completed the survey of Lake Kewagama district for the Quebec government, and has gone to make investigations at Keekeek.

W. Clayton Miller, general manager of the Federal Mining and Smelting Company, Wallace, Idaho, recently spent a short vacation in the vicinity of Salmo, Nelson mining division, British Columbia.

John T. Reid, of Lovelock, Nev., managing director of the Nevada United Mining Company, recently inspected mines at Butte, Mont., Chino, N. M., Ray, Miami, Globe, Jerome, Bisbee and Clifton, Arizona.

Prof. Willet G. Miller, provincial geologist of Ontario, and Cyril W. Knight are at Cobalt making a further study of the field in view of the later development of the camp, and more particularly investigating the ore-bearing possibilities of the diabase formation.

The chief of the Pennsylvania Bureau of Mines has appointed the four additional bituminous-coal mine inspectors authorized by the last legislature as follows: Richard Maize, Ivanhoe; Edward E. Girod, Brownsville; R. Mather, Tyrone; A. Furniss, Johnstown.

P. E. Van Saun, chief engineer of the Mill and Smelter Engineering Company, has returned to New York from Nevada after completing and receiving acceptance for the slime-cyaniding plant which his company built complete under contract for the Nevada Wonder Mining Company, of Philadelphia.

T. H. Aldrich and Walter Moore, of Birmingham, Ala., have been summoned to New York this week to give testimony before the Congressional investigating committee in reference to the affairs of the Tennessee Coal, Iron and Railroad Company and the United States Steel Corporation.

OBITUARY

Colonel W. C. Greene, at one time a prominent figure in the mining world, died at Cananea, Mexico, Aug. 5. His death was caused by pneumonia, following injuries received in a runaway accident. We hope to publish a full account of his life next week.

H. E. Lawson, prominent in the early days of Cobalt mining in connection with the Lawson mine, died in West Africa, July 12, from fever. He was a mining engineer of wide experience, having practised in India, Borneo, New Zealand and West Africa, as well as in Canada, and was the son of Sir Charles Lawson, a noted English author. At the time of his decease he was resident manager and chief engineer of the Bisichi Tin Mining Company, at Naraguta, Northern Nigeria. He was well known and much respected in Toronto, where his widow and children reside. He was a graduate of the Cambourne Mining School, in Cornwall.

John W. Gates died in Paris, Aug. 8, after a long illness, aged 56 years. He was born in Illinois, began business in a small way, and gradually came to be, perhaps, the best known stock operator in the country. He was purely a speculator, but his operations brought him into contact with the iron and steel trade, as he was largely concerned in the American Steel and Wire, the Tennessee Coal, Iron and Railroad, and the Illinois Steel companies, and had a part in the formation of the United States Steel Corporation. He parted with his shares in those concerns, but continued to hold control of the Republic Iron and Steel and some minor companies.

Hyatt S. Haselton died at Cleveland, O., July 27, aged 54 years. He was born at Janesville, Wis., and when a young man entered the employ of the Metropolitan Iron and Land Company. Later he became associated with S. S. Curry, who was a pioneer in the development of the Menominee iron range. Their activities about 1883 included development of the Beaufort and Titan properties on the Marquette range, attention also being devoted to the Felch mountain range. Later the Metropolitan company took up property in the Gogebic range and about 1885 the property had been developed into what has since been known as the Norrie mine. Mr. Curry was president and Mr. Haselton secretary and treasurer of the Norrie company. When the development of the Norrie property had been fairly well accomplished, they developed the Odanah mining property. After the Oliver Iron Mining Company purchased the Norrie mine, about 1899, Mr. Haselton went to Cleveland, entering the offices of Pickands, Mather & Co. He became secretary and treasurer of the ore-mining department, and was in charge of the ore-mining operations of the company.

SOCIETIES and TECHNICAL SCHOOLS

Institution of Mining and Metallurgy—The following notice has been issued from the office in London: "The council has, on behalf of the institution, accepted an invitation from the Canadian Mining Institute to hold a joint meeting in Ottawa or Montreal about the first week in March, 1912. The exact date and other information will be issued in due course, but it may now be stated that it is proposed to arrange a visit to one or two important mining camps, to follow the meeting."

International Iron and Steel Institute—The full membership of the organization committee appointed at the Brussels meeting on July 5 is as follows:

United States—Elbert H. Gary, James A. Farrell, E. A. S. Clarke, Charles M. Schwab, Willis L. King.

Great Britain—G. Scoby-Smith, Sir John Randles, Harry Steel, Jr., M. Mannaberg, Archibald Colville.

Germany—Baron von Bodenhausen, E. Schaltenbrand, F. Thyssen, Herr Reusch, Dr. E. Schroedter.

Belgium—A. Greiner, G. Trasenster, F. Lacanne, MM. Demoulin and Renson.

France—MM. A. Dreux, Pralon, Laurent, de Labriolle and L. Charbonnel.

Austria—A. R. von Kerpely, Wilhelm Kestranek, Dr. F. Schuster.

Hungary—Armin von Biro.

Russia—J. Jasiukowics, O. Bibet.

Spain—Count de Zubiria.

The committee organized by electing E. H. Gary chairman; W. B. Peat, of London, secretary.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Aug. 3—Edgar L. Newhouse, vice-president of the American Smelting and Refining Company, spent three days at the end of July in San Francisco in conference with E. B. Braden, manager of the Selby and the Balaklala smelteries. While Mr. Newhouse's visit in the West is for the purpose of inspection of all the plants of the company, the Balaklala received particular attention. What the result of the conference may ultimately be Mr. Newhouse was not ready to state; but this much may be said: that the smeltery was shut down on July 22 in accord with the voluntary stipulation filed in the United States court in June, and that the plant will not be dismantled. No experiments will be undertaken further than were made during the closing runs in July. The rumor that the company was considering a site for the removal of this or the erection of a new plant on the Nevada State line is wholly without foundation. This rumor hardly requires denial from the fact that in the entire copper region of Shasta county there are no copper ores of a value capable of economic and profitable smelting at a considerable distance from the mines. The argument that the site suggested is barren of vegetation is valueless, even should the site be within economic hauling distance. Either the farmer would follow up with an irrigation project or the Forest Reserve would be able to find a forest within damaging distance. It would be hard to find a more barren site than Bully hill occupies on Pit river, but that smeltery was closed to save the scrub timber. The closing of smelteries in Shasta county is a loss not alone to the copper-mining industry; the development and profitable operation of the gold mines must suffer as well. A large proportion of the gold-bearing ores in the county are refractory, and though much of the output is susceptible to profitable cyanidation the greater economy and surer profits were assured to the mines in proximity to the smelteries by the smelting process. The greatest development in the county followed immediately the establishment of the smelteries. The prosperity of the farmer has also been dependent on the profitable operation of the copper and the gold mines, since he is largely dependent on the home market for the disposition of the produce he raises. The diminution in population by nearly 2000 that has taken place within the last year and since the closing of the smelteries will have a noticeable effect. In fact, the farmers are already beginning to notice it.

Denver

Aug. 5—The July production of ore in the Cripple Creek district was 76,621 tons, of a gross value of $1,330,528. This is $24,417 less than the value of the June production, but when allowance is made for the three holidays, the daily average was greater than for last month.

The Gold Dollar Consolidated Mining Company has just issued its annual report. Instead of declaring two 1c. dividends during the last 12 months, as might have been done, the mine was developed, new houses were built and machinery purchased, at a cost of $20,000. This equipment will enable the company to sink to the 2000-ft. level, and to operate at that level when necessary. A result of the development done by leasers and by the company, was an important strike of ore near the 800-ft. level, from which a trial shipment is now being prepared. The shoot was cut about 150 ft. north of the main shaft. A winze was sunk from the eighth level at a point 100 ft. north of the shaft, and this winze is 100 ft. deep.

The richest copper ore that has come to the grubstake committee's headquarters was received yesterday from Reid Gwartney, one of the prospectors sent out by the committee. He is prospecting near Parlin, to the southwest of Gunnison county. The ore will probably assay 40 per cent. copper. It is from a new copper district. Gwartney reports that there is a large area of copper-stained rock, that rich float has been found, and that veins of ore have been uncovered. The first samples sent by him gave a fair assay for copper and gold, but the later samples are much richer. From Pine district, up Platte cañon, in Park county, some samples of copper and gold ores have been received. Several claims have been located and a group patented in that district, but there is a large territory yet to be prospected.

The Impert (French) process for reducing zinc ores may be tried on Leadville ore. It is claimed that by the process sulphide, silicate or carbonate ores may be treated at a cost that will make the treatment of 10 per cent. zinc ore profitable in camps within reasonable distance of transportation, such as Silverton, Rico and Creede, in the San Juan region, Georgetown, in Clear Creek county, and Montezuma, Breckenridge, Robinson, Eagle county, Leadville, and Chaffee county in central Colorado. The American rights to this process are capitalized at $3,000,000, and it is stated that the American company will probably mine as well as treat ores.

Butte

Aug. 2—The production of coal for 1910, in Montana, was slightly under 3,000,000 tons, having a market value at the mines of about $8,500,000, and for 1911 these figures should be considerably increased. Including the products of mines, farms and forests, the total wealth produced by the State for 1910 is estimated at $181,000,000, which on the basis of a population of 400,000 amounts to $452 for each person in the State. The agricultural production for 1910 exceeded the output of the mines, not including coal, by about $20,000,000 and owing to the rapid settlement of the agricultural districts it is estimated that this will be increased in 1911 by about one-third. That the State, with its absurdly small population in proportion to its size, should yield such figures at the present time is significant of the future.

The recent discovery of tungsten in the Potosi mining district near Pony, Madison county, is causing comment among mining men and it is believed it will lead to much activity in that region. In 1874 the district was an important silver camp and the ore was shipped out by pack horses, but with the decline in the price of silver the camp was abandoned with the exception of a few who continued to mine in a small way. Hübnerite, the tungsten ore found there, was mistaken for zinc by the operators of the silver mines and not until recently was the true character of the ore discovered by Thomas Evans, a prospector. The area in which the ore is found covers about 7500 ft. in length at an elevation of about 8000 ft. and is accessible from the town of Pony by a good wagon road. The geological formation consists of highly silicified porphyritic dikes forced up through a country of hornblende gneiss, and the veins vary in width from 1 in. to 8 ft. There are few districts producing tungsten, the largest in the United States being in Boulder county, Colo., and the development of the metal in commercial quantities in the Potosi district would be welcome to the mining industry.

Salt Lake City

Aug. 3—Fifteen coal-land entries involving about 9280 acres of lands in Kane county were canceled in a decision handed down in the Orderville coal-land case, July 27, by Register D. R. Thompson and Receiver M. M. Kaighn, of the Salt Lake land office. The lands in question have been under contest for three years, and the decision is based on the recent ruling on the Cunningham claims. According to the decision, it was the plan of the entrymen not to file for their individual benefit, but to coöperate and work the several claims as one enterprise, in violation of the Federal statutes. The enterprise was launched in a meeting in Orderville, Aug. 17, 1901, when a number of citizens met and effected an organization, electing a chairman, other officers and an executive committee. From the minutes of the meeting, it appeared that all who wished to interest themselves could do so by paying $5 within 15 days after the meeting. The executive committee was empowered to employ two men to work and develop the claims, to make assessments and to do whatever was necessary. There were 42 subscribers to the fund as members of the association, and 10 others joined later, making 52 in all. Assessments were levied from time to time in amounts of from $5 to $10, amounting to $45 for each member, the last assessment being levied April 23, 1910. From this joint fund were paid the expenses of development, etc., and attorney fees after charges had been made against the entrymen. Further funds to pay attorneys were secured from the Zion's Savings Bank and Trust Company on a $600 note.

In the testimony at the hearing it was shown that the association had secured a loan of $34,800 from the Zion's Savings Bank and Trust Company for financing the enterprise, and in payment of the loan the trust company, according to the agreement, was to accept 325,000 shares of stock out of a total capital stock of 1,000,000 shares, for which a new company was to be incorporated. The land-office officials are of the opinion that the entrymen acted in good faith.

Utah's coal production for 1910 shows an increase over that of 1909. In 1910, 2,517,809 short tons, valued at $4,224,556, were produced, as against 2,266,899 tons, valued at $3,751,810 in 1909, an increase of 11.07 per cent. in quantity and 12.6 per cent. in value.

The closing down of many of the mines in the Mississippi valley during the six-months strike in 1910 stimulated production in all of the Western coal States, even affecting Utah.

The resurvey of the Tintic district, which is going forward under the direction of Waldemar Lindgren, of the United States Geological Survey, will be completed in about two months. The department intends to send out another man to investigate mineral resources and conditions in the southern part of the State, including the Marysvale district, and Piute, Iron and Washington counties.

Houghton, Mich.

Aug. 5—Judge Weist, of Lansing, of the circuit court of Ingham county, Mich., granted the temporary injunction in the case of Charles M. Turner as a stockholder of the Osceola Consolidated Mining Company, to prevent the proposed merger of the Calumet & Hecla company with its subsidiary companies. This is the only one of the three decisions that have been rendered that is favorable to the opposition. The first decision was rendered by Judge Streeter, of the Houghton County circuit court, dissolving the restraining order issued by Commissioner Maisch to the Chadbourne heirs who asked for a temporary injunction prohibiting the merging of the Ahmeek company and the Calumet & Hecla company. Judge Swan, of Detroit, refused the temporary injunction asked for by Godfrey M. Hyams, as a stockholder of the Osceola Consolidated company. The Chadbourne case has been appealed to the Michigan supreme court.

The Calumet & Hecla miners held their fifth annual picnic on Saturday, Aug. 5. Governor Chase S. Osborn was in attendance and delivered an address to the miners. The company grants this day to its underground employees, and various sports are held, including hammer and drill contests, running races for old employees, etc. The proceeds from these picnics are donated to needy employees or their families, and a large sum is raised each year.

Birmingham, Ala.

Aug. 7—While the total production of pig iron in Alabama for the first half of the year decreased from 1,012,545 tons in 1910 to 809,795 tons in 1911, the make of charcoal iron increased, being 20,900 tons for the half year, or more than that in the first half of 1910 by 5561 tons.

The Edgewater mine, known as No. 13, of the Tennessee Coal, Iron and Railroad Company, a few miles from Ensley, is nearing that condition that steady operation can soon be started. The mine is equipped with the latest and most improved machinery, and it is expected that the production will be large.

Negotiations are under way looking to a lease of one of the larger mines in the Birmingham district to the State, 400 convicts to be worked in the mines, the coal to be purchased by the company leasing the mines to the State. This is somewhat different from the present method of hiring out the convicts, and the belief is expressed that the State will make more through this arrangement and the company making the lease will gain.

Porcupine

Aug. 4—Chairman J. L. Englehart, of the Temiskaming and Northern Ontario Railway Commission, after a trip of inspection through the camp, reports everything in as satisfactory a condition as could be anticipated. The members of the relief committee are working harmoniously and efficiently, and the repairing of the damaged portions of the railway is being pushed forward. The Northern Ontario Fire Relief Committee states that no further funds are needed for the immediate relief of the fire sufferers. The total subscriptions amount to $52,294.

The work of rebuilding is progressing rapidly, but difficulty is experienced in getting in lumber and supplies. About a million and a half feet of lumber has so far been purchased, but only a small part of this has reached the camp. Business of all sorts is being carried on under canvas, and at the mines most of the employees are living in tents. The Dome is now confining its energies to building the spur line into the property, and the temporary quarters will be used until the new buildings are erected.

The Ontario government has granted an extension of two months' time from the date of the Porcupine fire to prospectors and mining men, in which to do assessment work on claims in the district.

Toronto

Aug. 4—Acting on the strong representations of the provincial governments of Saskatchewan and Alberta and the Boards of Trade and other public bodies of the western provinces, as to the danger of a coal famine owing to the continuance of the miners' strike in British Columbia, the Canadian government, on July 31, adopted an order-in-council providing for the free entry of coal imported into Canada at all ports along the international boundary west of Sault Ste. Marie for consumption in British Columbia, Alberta, Saskatchewan and Manitoba. The remission of the duty goes into effect Aug. 7, unless the parties to the strike effect a settlement and resume operations before that date, and is to continue in force so long as, in the opinion of the government, the coal mines fail to produce sufficient coal to meet the requirements of the public.

Another relief measure adopted by the railway companies is the reduction of the freight tariff on all coal carried west from Fort William and Port Arthur. There will be no change in the rate to Winnipeg, but material reduction is made to the places affected by the strike. The rate to Calgary is reduced by $3 per ton. It is anticipated that large quantities of coal will be brought in from Montana, and investigations are being made as to the feasibility of securing rates on coal from Indiana and Illinois.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

The interests owning the Wonder Creek dredge and power plant on Seward peninsula and the Bourbon dredge have consolidated. E. E. Powell has charge.

Treadwell—The dam across Ready Bullion creek is to be extended 200 ft. and raised 20 ft. When completed, this dam will be 700 ft. long, and will create an artificial lake one mile long.

Bhart—This property, on Chicagoff island, has been bonded by E. J. Short, Sitka, who is planning considerable development work.

Jualin—A crew of men is at work on this property near Juneau, under the direction of Albert Nadeau. The company expects to be able to make some early shipments.

Mt. Andrew—A shipment of 1000 tons of ore was recently made by this mine to the smeltery at Tacoma. Work on the tunnel is progressing.

Kokrines—A new strike is reported on a creek emptying into the Yukon below this point.

Chichagof—One 10-stamp mill on this creek is turning out about $800 per day in gold.

Arizona

Cochise County

A vein of high-grade copper ore was recently cut in Young Brothers' mine in the Gleeson district. The ore contains copper, gold and silver. The mine adjoins the property of the Leadville Mining and Smelting Company.

Maricopa County

Pick and Drill Mining Company—The reduction plant at this mine near Agua Fria was recently put in commission. Five shoots of ore on the 800-ft. level are being developed, and some ore has already been blocked out.

Carney Development Company—This company has secured control of a copper-gold mine 32 miles east of Mesa, and will start developing at once.

Big Blue Mining Company—A 40-ton reduction plant to be built 16 miles north of Wickenburg, is being planned.

Mohave County

Union Basin—At the property of this company extensive improvements are to be made.

Tom Reed—Recently $40,000 was distributed in dividends and it is reported that enough ore is now blocked out to maintain the present earnings for over a year. A large orebody has been opened on the 550-ft. level.

Gold Road—The mill is crushing 300 tons of ore per day . A recent shipment of bullion worth $34,000 was received at Kingman, as the result of one week's milling.

Pima County

Pioneer Smelting and Refining Company—The erection of the new smeltery 18 miles from Tucson has been commenced and the company will be ready to buy ore in September.

Sterling Development Company—This company is making regular shipments from its mine in the Babiquivari mountains. A new shaft is being sunk and drifting will be commenced at 50 feet.

Santa Catalina—At this mine of the Copper Queen Company much ore is being developed.

Pinal County

It is reported that an old mine was rediscovered recently, the ore of which is rich in gold, silver and lead. There are indications that the mine was worked in the days when the Apaches controlled this part of the country.

Yuma County

Clara Consolidated—This company recently installed a large blower at the plant near Swansea. Custom ores will now be treated at the reduction works.

California

Amador County

Lincoln—The oreshoot on the 800-ft. level is reported to be maintaining an average width of 5 ft., and recent assays show $11 per ton in gold. Development continues on the 500- and 1200-ft. levels.

Butte County

Gold Bank—A carload of concentrates that had remained on the dump of this mine at Forbestown was recently shipped to Selby, and returned a profit. The mine, in the early days, was one of the biggest gold producers in the county. It was recently purchased by Frederick J. Stoers, of Oakland, and M. J. Cooney and others, of Oroville.

Stanley—The 225-ft. tunnel in this gravel mine in Philbrook valley has reached pay gravel. Another tunnel is in 175 ft. E. B. Ward and others, of Oroville, owners.

Calaveras County

Utica—It is reported that W. P. Hammon is negotiating for the purchase of this quartz mine at Angels, owned by the Lane Investment Company and others.

Comet—The 10-stamp mill being installed at this mine at San Andreas is nearing completion. It will be run by water power from Clark ditch. F. L. Harrington, Oakland, owner.

Boston—It is reported that Nevada men contemplate the purchase of this mine near San Andreas.

Eldorado County

Monarch Consolidated—This mine, which has been in litigation for several months, will be reopened by the owner, H. E. Smith, of Portland, Ore.

Carpendar—The third shift of men was put on at this mine near Placerville. The mill is in operation, and a new telephone line has been built.

Humboldt County

Kalmath River Mining Company—C. A. Sample, of Eureka, manager of the hydraulic mines of this company at Weitchpec, reports that the last season was profitable. Lumber is now being sawed for new sluices for next winter's run, when a new cut will be opened.

Inyo County

Unexpected—It is reported that Wilkerson Brothers, of Big Pine, have sold this property on the east slope of White mountain to Eastern men. About 1000 ft. of development has been done, with the main shaft down 90 ft., from which a crosscut disclosed a large orebody between rhyolite foot and lime-shale hanging wall. The new owners contemplate sinking to 500 ft., and using electric power.

Kern County

Good Hope—A strong vein has been disclosed in this claim in Randsburg district, owned by the Consolidated Mines Company. The shaft will be deepened to 100 ft. and driving done on the vein.

King Solomon—The extension of the rich oreshoot in the Butte has been opened in this mine. Ten tons of high-grade ore have been stoped recently from the 100-ft. level.

Butte—The west drift on the 100-ft. level has been advanced 75 ft. in a vein of high-grade ore, making the total length of vein matter opened 150 ft.; stoping will follow. A winze is being sunk on the orebody at the 165-ft. level to determine the depth.

MARIPOSA COUNTY

Treasure Gold Mining and Milling—This company is to use electric power for the mine and mill near Hornitos instead of gasolene. The transmission line will be extended from the San Joaquin Light and Power plant at Hornitos.

MODOC COUNTY

Hoag—The Jim Williams interest in this mine near Bidwell has been sold to J. M. Stone, who has been elected president. Upon the completion of the aërial tramway the mill and mine will be operated double shift.

MONO COUNTY

Pittsburg-Liberty—Arrangements have been completed for resuming work at this mine and mill at Masonic, under the management of P. J. Conway, trustee.

NEVADA COUNTY

North Star—A contract has recently been made with the Taylor Foundry and Engineering Company, of Grass Valley, for the manufacture of a 250-h.p., electric-driven, five-throw, variable-speed plunger pump, of 750 gal. capacity, under a total vertical lift of 900 ft. The pump will be placed at the 1700-ft. level of the Providence shaft, this shaft being selected because of its central location for draining the Champion, Merrifield and Home shafts. Similar pumps have been for some time in operation in the North Star and the Prescott Hill mines, and recently the Empire mine installed two. Thirty men have been added since the North Star took over the Champion, making a total of 60 now employed in development and extraction.

Independence—The new five-stamp mill is running on good ore from the stopes. Sinking will be resumed.

Blue Lead—Three important hydraulic mines on Relief hill, at North Bloomfield, have been consolidated by the Blue Lead Consolidated Gravel Mining Company, recently incorporated. J. Oscar Jones, Nevada City, president, and W. F. Engelbright are directors of the corporation.

PLACER COUNTY

Sprague-Keasberg—Kilns will be built at this magnesite property on the Iowa hill divide. Wood and water are abundant.

PLUMAS COUNTY

Brown Bear—Bedrock has been struck in this gravel mine with a boring machine at a depth of 60 ft. The gravel is of sufficient value to warrant driving a tunnel. Mr. Dennison, of Santa Cruz, manager.

Rose Quartz—The mill is being readjusted and placed on a new foundation at this mine in Poorman Creek district. A 7-ft. vein has been opened in the 50-ft. tunnel. Mrs. Julia Kelly, superintendent.

Colorado

BOULDER COUNTY

Boulder mine operators see great promise of early improvement in tungsten market conditions. The owners of the Wolf Tongue mill have sent out notice that they will now purchase a limited amount of tungsten ore, and it is believed that they will soon be in a position to take all that is offered. The Primos Chemical Company, of Primos, Penn., is arranging for extensive operations, which include the sinking of the Conger shaft to a depth of 1000 ft. This company supplies the Eastern steel trade.

Wood Mountain Milling and Mining Company—The $75,000 mill was recently destroyed by fire.

CLEAR CREEK COUNTY

Combination Mining and Leasing Company—This company has let the contract for a complete new installation of machinery at the Boneita mill to Peter McFarlane & Co., of Black Hawk. The machinery of the old plant has been torn out and the waterwheel replaced to give more room. Additional ground in the street north of the building has been granted the company by the city. In this manner much more room has been secured for the larger and more complicated plant designed by Manager Staley and Mr. Billings, the milling engineer. The new plant is, under the contract, to be in working order by Oct. 20. The process is amalgamation and concentration.

LAKE COUNTY—LEADVILLE

Ibex—At this property zinc carbonate ore is now being mined. From the block of ground under lease to George Stewart three cars of this ore have been shipped.

Iron Silver—From the Baby shaft about 25 tons of ore per month is being shipped. It is thought that a shoot of zinc-carbonate ore is being approached.

National—An important strike is announced by Manager Joseph Horner. The company controls 500 acres on Sugar Loaf mountain. A year ago the company started a crosscut tunnel to cut veins at a depth of from 800 to 1000 ft. This tunnel has been driven 3400 ft. through solid granite at a cost of $80,000. A few days ago the character of the rock began to change and a large vein was opened.

SAN JUAN REGION

Damages of $500,000 are asked by the Moorehead Mining and Milling Company in a suit brought in the district court against the Liberty Bell Gold Mining Company, charging trespass of the Liberty Bell on veins of the Moorehead company. The latter claims that in the last three years the Liberty Bell company has taken ore worth $2,500,000 from the property in dispute.

The activity in the La Plata district is more apparent this year than ever before, and scores of prospectors are searching the hills for veins of gold ore. The result is that new strikes are continually being reported. The Idaho and the May Day mines are tied up by injunction suits. The Incas mine, under lease by George W. Avery, has developed into a profitable mine since last September. During June it shipped 495 tons of ore. There is a large quantity of ore exposed and development continues to open more. On the Comstock, operated by J. T. Crowdis, a 300-ft. drainage and operating tunnel which cuts the vein at a depth of 125 ft. is being driven. The tunnel is now in 190 ft. The Lucky Moon is operating two shifts, driving a crosscut tunnel, and rich ore has been found near the surface. The Cumberland group is shipping ore to the Durango smeltery. At the Ten Broeck property, leased by H. L. Lilly, William Bird and John Morlock, of Durango, development work has opened bodies of high-grade ore.

A deal of more than ordinary importance was closed during the week when the Little Maud mine in Maggin gulch was taken under lease and option to purchase by the Danford Investment Company through its representative, E. J. C. Riley, of Cripple Creek.

Tomboy—During June 8800 tons of ore milled yielded $69,000. A profit of $25,500 was made.

TELLER COUNTY—CRIPPLE CREEK

El Paso—After being closed 10 days work has been resumed at this mine, with over 200 men working. In July, 65 cars of ore were shipped, a decrease of 55 cars below the usual monthly average, owing to the closing of the mine two weeks for repairs. Of the shipment, 25 cars were mined by leasers and the rest by the company. The water stands 20 ft. from the pumps in the main shaft, and in the last week has not shown much recession. Sinking of the Nicholas shaft is going on at the rate of 4 ft. per day.

Roosevelt Tunnel—The committee appointed by President Beck to secure money to be used to drive the tunnel another 2000 ft. into Beacon hill reports that most of the money necessary has been subscribed. An application to lease a portion of the El Paso ground to be worked through the Roosevelt tunnel has been filed with the company.

Ajax—A strike of importance has been made on the 600-ft. level of the Ajax shaft by Morgan and Millers, leasers, after drifting north on this level over 50 ft. The strike was made in the breccia. The extent of the shoot has not been determined.

Stratton's Independence—During June 2366 tons of ore was mined and 10,100 tons of dump ore was milled. The net profit was $12,813; $980 was spent for special development.

Specimen—Eric Johnson and Philip Argall have taken a lease on the Specimen property on Bull hill, owned by the Stratton estate, and have begun operations. They will develop the mine, running a crosscut to the west on the 300-ft. level to tap one of the orebodies worked on the first two levels but not found on the third.

Elkton—Charles Smith, working in the Tornado shaft of the Elkton estate, is shipping about two cars of ore per week.

Illinois

There have been no new developments with respect to the Jones process as applied to zinc ore. Mining operations have not been started at the Black Jack mine, where the Jones test plant is situated, and there is good reason to believe that the promoters now consider the process a failure as applied to zinc ore.

Indiana

Clay County

The working contract entered into by the miners and operators of the Indiana block coalfield is held intact, and the attempt to force a weekly payment will fail. The joint board composed of miners' district officers and the operators in the asociation held an all-day meeting and resolved that the working contract entered into in good faith by the miners and operators on April 12, 1910, should be kept and the miners should be satisfied with the semi-monthly pays until the expiration of the contract, April, 1912.

A company of Michigan men, headed by John Snyder, has leased a large tract of land near Staunton, and will at once begin drilling for coal and clay. If the desired quality of clay is found the company will build a clay plant in addition to sinking a coal shaft.

Greene County

A 4-ft. vein of coal has been discovered about 7 ft. below the surface on the Chambers farm, east of Linton. The discovery was made by some men working on the farm repairing tile drains. The coal is said to be equal to the best coal found in the district. Mr. Chambers proposes to remove the surface earth by means of a steam shovel, and, if the vein appears extensive, machinery will be installed.

Vigo County

The National Coal and Fuel Company, of Terre Haute, resumed work, Aug. 2, after six months of idleness caused by the mine being flooded. The south side of the big mine was so badly damaged that it cannot be worked, but the north side is in better shape. George Donie, Sr., has been appointed mine boss.

The Deep Fourth Vein Company, newly organized with officers in Terre Haute, will soon begin work, having leased the Deep Vein mine.

Michigan

Copper

Calumet & Hecla—The company has about completed the plans for the new regrinding mill, to be erected on its conglomerate sands, in proximity to the Hecla stamp mill. The proposed mill is to be nearly a duplicate of the present mill that is treating the tailings from the Calumet mill, with the exception that conical pebble mills will be used in place of chilean mills for the regrinding of the tailings. The concentrating portion will be practically the same. It is planned to erect half of the mill at once. This will be used for treating the tailings direct from the Hecla mill. The second half will be erected soon after, and will work over the old sands.

Ojibway—This company is stoping at 12 points in the two shafts, and is getting ready to begin milling operations. The Phœnix mill has been inspected by Superintendent Shields, of the Quincy mill, and he reports that it is in good condition and can treat Ojibway ore successfully. A few minor repairs and changes are to be made before rock shipments start. This will give the Ojibway a short haul from mine to mill, and will make transportation charges light.

Iron

Newport—Out of a total force of 1700 men at work under normal conditions at this mine on the Gogebic range, 1200 have been laid off. Operations are confined to four or five days per week with day shift only. Further reductions in forces are expected.

Montana

Butte District

Butte-Alex Scott—The company has $65,000 cash surplus in the treasury and all of the machinery is paid for. A station is being cut on the 205-ft. level of the Little Annie mine and as soon as the sump is completed, drifting will be started both east and west on the vein.

Gallatin County

West Gallatin Mining and Milling—This company has been organized by Bozeman men for the purpose of operating 220 acres of placer-mining ground in the west Gallatin basin. Among the stockholders are Thomas Michener, J. G. Steffens, H. M. Sitherwood, W. L. Griffith, Guy Hunter, Charles Francis and R. D. Huff. Construction has been started on a ditch to be 4.25 miles long, capable of carrying 800 in. of water to their property. The company expects to get the water on the ground by Sept. 1, and to start sluicing immediately.

Jefferson County

Boston & Corbin—It has been decided by the directors to erect a 300-ton concentrator at once, as it has been recommended by Manager Emerson and the company's consulting engineer. Ore reserves from the 900-ft. level, up, have been estimated at 300,000 tons, which is sufficient to run the concentrator for three years even if no more development work is done. For the purpose of financing the erection of the plant and to provide working capital, the company is considering the issue of $450,000 worth of 12-year, 6 per cent. convertible bonds. These bonds would be convertible into stock at $15 per share at any time.

Corbin Copper—The Dewey tunnel encountered the vein some months ago, and drifting and prospecting proved that it was on the top of the orebody. Recently the ledge was cut by the Bonanza tunnel and a drift has been driven 30 ft., showing the orebody to have an average width of between 3 and 4 ft. A crosscut from the tunnel has cut the vein 150 ft. to the east, showing about the same character of ore. As the Bonanza tunnel is on the same level as the concentrator, this ore can be handled by gravity and hauled directly to the concentrator which will be put in operation as soon as the orebody is opened sufficiently to permit stoping.

Park County

A bill has been introduced in Congress by Senator Myers, of Montana, authorizing the Conrad-Stanford Mining Company, owning the Crevasse mining claims in the Crevasse mining district, to build a power plant and stamp mill inside the boundary of the Yellowstone park on the Yellowstone river, and to build an electric transportation line from the plant to the mines, one-half mile distant. The mines have not been operated in recent years owing to the high cost of mining the ore and transporting it, but there is a large amount of low-grade ore in sight, and with the cheap power for mining and milling produced by the proposed power plant, a marked reduction in costs can be made. In making this petition through Senator Myers, the company agrees to pay to the Government a royalty of 35c. per ton on all ore mined, the proceeds to be used for park improvement.

Nevada

Comstock Lode

Ophir—In July 1356 tons of ore was hoisted, the gross assay value of which was $50,459, an increase of $12,000 over the preceding month. For the last three months the net receipts of the company for ores treated were $104,683, or an average of nearly $35,000 per month. One run of 2000 tons of ore gave net returns of $61,588. The average assay value of the ore is between $40 and $50 per ton. The total ore output from the Comstock district for July, according to reliable estimates, was $175,000; the producers being the Phœnix, Monte Cristo, Cosmopolitan, Chollar, Potosi, Gould & Curry, Crown Point, Justice, Mexican and Ophir.

Mexican—The ore extraction for the month of July was 1810 tons, of a gross assay value of $71,776. The shipment of first-class ore to the smeltery included 12 railroad cars, the net returns from which were $44,860. Deducting the mine and general expense for the month, leaves a large cash reserve in the treasury; the surplus will go toward defraying the cost of the new mill construction, ground for which is being broken. The vein on the 2500 level has been opened for a distance of about 110 ft., and in width from 15 to 30 ft. The new electric hoist for the winze to be sunk in the ore below this level, is now being installed.

ESMERALDA COUNTY

Goldfield Consolidated—The estimate of production for July is 29,174 tons containing $790,000 gross and $570,000 net, with operating expenses of $220,000. It is stated that the mines are looking well.

Goldfield Deep Mines Company—This company has been incorporated under laws of the State of Washington, with a capitalization of 10,000,000 shares, par value $1. Officers are J. Ross Clark, Los Angeles, president; C. O. Whittemore, Los Angeles, vice-president; Claude A. Smith, Goldfield, secretary. The company will operate in the Goldfield district, and controls the Goldfield Merger Mines Company. The latter company has been reorganized and will be operated independently. Senator William A. Clark is said to be interested in the new company.

LYON COUNTY

Mason Valley—The Pacific Livestock Company has asked for a temporary injunction to prevent the operation of the smeltery at Thompson. It is alleged that fumes will kill the vegetation. The plaintiff owns 20,000 acres of ranch land near the smeltery. The injunction will not stop the construction of the smeltery. Observations of the prevailing wind for a year indicated that 97 per cent. of the time the fumes are blown away from and not into the valley.

New Mexico

GRANT COUNTY

Tyrone—Drilling on this group of claims has been stopped because of the unfavorable decision of the General Land Office regarding the title.

SOCORRO COUNTY

Tri-Bullion—The 70-ton concentrator is being operated 24 hrs. per day on zinc-sulphide ore. Zinc carbonates are also being produced from the upper levels.

Juanita—Leasers have opened a streak of zinc-carbonate ore and are making daily shipments to the smelteries.

Oregon

JOSEPHINE COUNTY

Golden West—This company is considering the installation of new machinery. W. H. Ramsey, Grant's Pass, has charge.

LANE COUNTY

North Fairview—Eastern men have become interested in this property; some new machinery will be installed, and development work carried on. Herbert Leith, Bohemia, is manager.

Utah

BEAVER COUNTY

Utah Gold Crown—The company has filed articles of incorporation. The property consists of 14 claims northwest of Milford, near the head of Beaver cañon. The capitalization is $50,000, divided into shares of 5c. each. Henry C. Gale is president.

Big Gentile—This property is a half a mile north of the Moscow mine in the Star district, and consists of six claims and a fraction. A lease and bond has been taken by L. Hall and associates, of Milford.

JUAB COUNTY

Chief Consolidated—Ore has been encountered on the 1400-ft. level, 300 ft. north of any previous work. The first car lot from this brought in $2200, or an average of $50 per ton. New ore has been encountered in driving a raise from the 1600-ft. level.

Opex—Some trouble from bad air has been experienced. Two shifts are being worked, and three machines are in operation. Most of the development is being done on the 1700- and 2000-ft. levels.

Iron Blossom—On the 500 level of the No. 3 workings, drifting is being done to connect with the No. 1 workings. The face of the drift is still about 500 ft. from the point where connections are to be made. The diamond drill is giving satisfactory service in crosscutting on the 1900-ft. level.

Opohongo—The shaft is 30 ft. below the 600. Rumors regarding a possible sale of this property are emphatically denied by William Hatfield, president.

Tintic Central—Surface water is coming in on the 1040-ft. level at the rate of 5000 gal. in 24 hours. The workings are not within 700 ft. of the permanent water level, and the shaft is still sinking, the water causing little delay.

Mammoth—The orebody opened some time ago on the 800-ft. level northeast of the shaft in hitherto unexplored ground, has been encountered on the 900.

Scranton—A new body of lead carbonates has been opened in the Del Monte tunnel at a vertical depth of about 400 ft. The mine is shipping from 600 to 1000 tons of ore per month. It produces lead ore, zinc ore and a combination of lead and zinc ore, all being of shipping grade. The company is a close corporation, the control being held by Pennsylvania men.

Victoria—Work has been hampered by the breaking down of the engine used in hoisting ore from the winze on the 1050 level, but a new engine is now in service and shipments have been resumed.

Gold Chain—New buildings are being erected, and preparations made for the installation of new machinery.

Sioux Consolidated—Three shifts are at work on the 600-ft. level, and the drift is about 180 ft. from the point where the ore is looked for.

SALT LAKE COUNTY

Alta Consolidated—Articles of incorporation were filed July 28. The ground owned by this company has been producing for 30 years, the ore being lead, silver and copper. The lower tunnel is in 1200 ft., giving a vertical depth of from 500 to 600 ft. on the outcropping veins. Milling ore has been opened, and active mining will be undertaken with a force of 12 men. Tony Jacobson is president.

Utah Metal—The tunnel being driven from the Toole side of the Oquirrh range is about a mile long at present, and work is progressing at the rate of 12 ft. per day. Work will soon start from the Bingham side, at which time it is expected the headings will be about 6000 ft. apart.

SUMMIT COUNTY

Little Bell—Work was resumed July 19, after a close down of several weeks. Shipments of ores from the dump have been started at the rate of 50 to 60 tons per day, and mining and development is being done. The work is under the direction of Joseph Kemp.

UTAH COUNTY

Pacific—Three teams are hauling ore from this property to the railroad, and several shipments have been made. A 2-ft. vein of practically solid galena was opened a short time ago.

Washington

STEVENS COUNTY

Pacific Copper—The company is considering the installation of a mill on its property. M. E. Hosea, Spokane, has charge.

West Virginia

GREENBRIER COUNTY

Near Wendel the Maryland Coal Company is planning to build a new tipple and to open up the Armstrong & Koontz tract of 1500 acres of gas coal.

LEWIS COUNTY

The Jacksonville Coal and Coke Company, near Weston, was recently sold at public auction for $15,000 to R. W. Crawford and C. C. Reyer.

Canada

ONTARIO

Wilbur—These iron mines owned by the Ontario Exploration Company have been closed, and will probably not be reopened until spring.

ONTARIO—COBALT

The shipments from Cobalt for the week ended July 28 were: La Rose, 152,290; Nipissing, 130,470; McKinley-Darragh, 123,830; Buffalo, 103,700; Temiskaming, 94,620; Hudson Bay, 62,500; Crown Reserve, 69,000; Chambers-Ferland, 60,000; Trethewey, 46,700; total, 843,110 pounds.

Doctor Reddick—The shaft and drifts have been pumped out on this property at Larder Lake, and pipes laid and crosscutting northward to the orebodies commenced in two places. The stamp mill will be in order by the middle of the month.

Rochester—A contract has been let to the Lumsden mine to do between 1000 and 1200 ft. of exploratory work on this property.

La Rose—The Violet property of this company is again being worked.

Nipissing—Hydraulic prospecting will be undertaken as soon as a plant can be installed. The latter will include a large turbine pump capable of delivering 4800 gal. per min. A 700-h.p. motor to supply power is now on the ground. So far prospecting has been done entirely by trenching, but it has been found that some good veins were missed.

Buffalo—During July the Buffalo mill ran 575 hours and treated 3487 tons of ore averaging 40 oz. in silver before treatment. Expenses of the mill for the month were $4622. The extensions to the cyanide plant have been completed, and it is now running satisfactorily.

Millerett—This mine at Gowganda has shipped 30 tons of concentrates, being the first output of the recently installed concentrating mill.

ONTARIO—LAKE OF THE WOODS DISTRICT

Scovil-Moore—This copper property near Kenora is being worked by Doctor Scovil and Frank Moore, of Kenora. A shaft is being put down 100 ft. At the 40-ft. level a drift was run 20 ft., samples of ore being obtained at that depth.

Ophir—The mine, which has been idle for 20 years, is now owned principally by Hon. Charles Fishback, of Chicago, and is being worked by a small force in charge of Superintendent James Morton. The shaft has been continued to a depth of 100 ft., and drifting done on the 50- and 100-ft. levels. The vein has widened to 9 ft. on the lower level.

ONTARIO—PORCUPINE

Jupiter—The development of the recent discovery on this property has disclosed some of the richest ore that has been found in the district.

Imperial—Arrangements are being made for replacing the plant and buildings that were destroyed by the fire.

North Thompson—This claim has been sold to John C. Hicks, of New York, and a stock company will be formed to develop the property.

McAulay-Bridge—B. E. Cartwright has purchased this property in Bristol township. The formation is similar in some respects to that at Pearl lake. In places the vein is exceptionally wide, showing free gold in quartz stringers.

Crown Reserve—A shaft has been put down 50 ft. on No. 2 vein and drifting undertaken at that level has encountered some ore showing free gold. Near the north boundary a shaft is also down 50 feet.

Hollinger—The work of reconstruction is proceeding rapidly, as there is no delay in procuring lumber, as is the case with some other properties. The company cuts its own logs and owns a sawmill at Miller lake, with an output of between 15,000 and 20,000 ft. per day. The mine buildings will be in a group at one end of the property, and the foundations for one compressor and the boilers are about completed.

Mexico

CHIHUAHUA

Palmarejo—It is reported that the hydroëlectric plant to furnish power to the mine has just been completed. An aërial tram is to be built between the mine and mill. The old mill has been demolished and preparations are being made to start work on a new mill of 300 tons capacity; it will be driven by water power. The crushing machinery will include stamps and tube mills; the ore will be treated by cyanidation.

La Republica—During June 1051 tons of ore milled yielded 78,657 pesos; operating expenses were 52,393 and general charges 7188 pesos.

Sierra Plata Mining Company—At this Parral mine, a three-compartment shaft is being sunk and raising is being done from three levels. A modern crushing and sorting plant will be built. The present output of 85 tons will be increased to 300 tons per day. Roy H. Allen is manager.

El Verde—This mine of the Compañia Exploradora y Explotadora de Guanacevi is being examined for Austrian people. Silver ore is being shipped to the Torreon agency. Leopoldo Iwonsky is in charge.

HIDALGO

Nepton Tunnel—Steady progress is being made in driving this tunnel that was commenced 18 years ago, with the object of draining the properties of the Compañia Metalurgica de Atotonilco El Chico. This tunnel, taking the San Rafael group as a center, is destined to drain the Pachuca district. It will be about 35,000 ft. long and will debouch within the limits of El Chico at Las Adjuntas at the confluence of the Milagro and Puente rivers. The tunnel will pass under Pachuca at a depth of 1500 ft. below the plaza. Over 10,000 ft. have been completed, the greater part of which was driven by hand drilling, but now power drills are being used.

JALISCO

Mirador Mining Company—This company, operating in the Hostotipaquillo district, is receiving the machinery for its new reduction plant, at Magdalena. It will be forwarded as soon as possible and will be installed in a part of the mill of the El Favor company. Both companies are controlled by the same interests.

Mina Grande—This mine, in the Hostotipaquillo district, is shipping silver ore to the San Luis Potosi smeltery. W. A. Hoenig is general manager.

SONORA

Calumet & Sonora—This Cananea company has just completed the installing of an electric hoist at the Catalina shaft. Current is being obtained from the Cananea Consolidation company. Some of the machinery for the electrostatic plant has been delayed in shipment.

Washington—The owners are now considering organizing a company to develop this copper mine, near Huepac. It is reported that there is blocked out a quarter of a million tons of ore that assays from 2 to 3 per cent. copper. The ore is similar to the ore from the Moctezuma mine, and it is expected that an unusually high recovery can be effected by concentrating.

Victor Gold Mining Company—At this property, near the Creston-Colorado mine, a pipe line has been built to carry water from the latter. Work will be started on the new mill as soon as the supplies arrive.

Zambona—At this property, at Minas Nuevos, in the Alamos district, 10 additional stamps and a tube mill were recently installed, bringing the capacity of the plant up to 100 tons per day.

Muchacho Grande—At this mine, at Matopaco, Alamos district, development work is being done. The ore is low grade, but the quantity large.

Cabullona Copper Company—The San Marcos mine of this company has been sold to Eastern men, who will proceed at once with development work upon a larger scale.

Asia

CHOSEN

Oriental Consolidated—The cleanup for July, according to cable report, amounted to $94,500.

The Markets

Coal Trade Review

New York, Aug. 9—Coal trade in the West is in about the same condition, few changes being noted. Steam-coal demand is a trifle better, but on the other hand the Lake trade has slackened down a little.

In the East the trade shows a slight improvement, and there is rather a better demand from manufacturers. Anthracite trade is in good shape, with a fair business forward for the summer.

The Government has begun suit against the alleged bituminous-coal trust formed by the Hocking Valley and other companies in Ohio. Particulars are noted on another page.

Coal Rates to the Seaboard—The Philadelphia *Bulletin* publishes a statement of rates on bituminous coal to seaboard points, from which the following table is compiled, showing the total rates and the rates per ton-mile from leading districts to the chief distributing points at tidewater:

District:	To:	Miles	Rate	Rate per Ton-mile
Pocahontas, W. Va.	Norfolk...	377	$1.40	0.371
New River, W. Va.	Newport News...	381	1.40	0.367
Kanawha, W. Va.	Newport News	410	1.50	0.366
Marrowbone, Ky	Newport News...	636	1.70	0.267
Meyersdale	Baltimore	215	1.18	0.549
Meyersdale	Phila	311	1.25	0.402
Meyersdale	N.Y. Harbor	391	1.55	0 396
Beech Creek, Penn	Phila.	229	1.25	0.546
Beech Creek, Penn	N.Y. Harbor	308	1.55	0 503
Clearfield, Penn...	Baltimore	242	1.18	0.488
Clearfield, Penn	Phila.	262	1.25	0.477
Clearfield, Penn...	N.Y. Harbor	323	1.55	0.480

Distances are from the central or basing point in each district to the various seaboard points named by the shortest line. Rates per ton-mile are in cents.

Coal Traffic Notes

Anthracite-coal shipments in July were 4,804,065 long tons, being 1,411,292 tons less than the heavy shipments in June, but 602,006 tons more than in July, 1910. For the seven months ended July 31, the shipments were, in long tons:

	1910	1911	Changes	
Reading	7,053,018	7,496,145	I.	443,127
Lehigh Valley	6,568,466	7,293,203	I.	724,737
N. J. Central	4,833,269	5,214,749	I.	381,480
Lackawanna	5,592,255	5,613,247	I.	20,992
Del. & Hudson	3,681,254	4,133,936	I.	452,682
Pennsylvania	3,449,620	3,754,020	I.	304,400
Erie	4,240,346	5,098,607	I.	858,261
N. Y., Ont. & West.	1,598,579	1,509,741	D.	88,838
Total	37,016,807	40,113,648	I.	3,096,841

The total increase this year was 8.4 per cent. All the companies showed gains except the New York, Ontario & Western.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

Aug. 9—Summer dullness is quite the rule in the trade locally, as far as domestic sizes are concerned, and most collieries are on short time. Steam coal is more active, and some sizes are short in supply. A fair quantity of coal is going to Buffalo for Lake shipment.

Schedule prices for August are $4.65 for lump, $4.90 for egg and stove and $5.15 for chestnut; all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.25@2.65; No. 2 buckwheat or rice, $1.70@2.20; barley, $1.40@1.65; all according to quality, f.o.b. New York harbor.

Bituminous

There is a little better feeling in the trade. Coastwise business is looking up, and New England manufacturers seem inclined to order more freely. Harbor trade is irregular and just now is rather quiet. All-rail trade is steadier than it has been.

Prices are about the same, but the low range is better, because there is very little free coal at tide. A good Miller vein steam coal can be had at $2.50@2.60, f.o.b. New York harbor. Lower grades sell down to $2.35 and better up to $2.90. Gas coals are quoted at mines $1.15@1.20 for ¾-in. and $1.05 @1.10 for run-of-mine. Slack is still too plentiful and prices are irregular.

In the coastwise business vessels are in good supply and there is no quotable change in rates.

From Norfolk off-shore business is reported good and increasing.

Birmingham

Aug. 7—Coal operations in Alabama are better today than they have been at any time this year. Mines are being put on full time or resuming operations altogether. Announcement is made that several orders of consequence are pending and the deals may be consummated at any time. Representatives of the larger coal companies of this district have been to New Orleans, Pensacola and Mobile recently, and the indications are that there will be more coal shipped to the ports in the Southern waters than ever before during the coming winter.

The coke market in Alabama is stronger also. There is a larger production than at any time this year. In addition, new coke ovens are being rushed to completion and old ones being put in shape.

Chicago

Aug. 7—Quiet conditions continue in the coal market, which will not be able to absorb larger shipments than are now coming, for a month at least, of any kind of coal. Owing to increased shipments, screenings are not so strong as for several weeks, but still are the favorite of the local consumer. Some country dealers are taking in domestic supplies, but even anthracite sells in light quantities.

Illinois and Indiana coals bring on cars $1.90@2.25 for lump, $1.70@1.85 for run-of-mine, and $1.40@1.65 for screenings. The demand for the best grades of these coals, in the harvesting trade, is especially good.

Coals from east of Indiana are in general kept down by the large supply and light, though steady, demand. West Virginia smokeless sells for $2.95@3.05 for run-of-mine, and $3.90@4.30 for lump, with the latter size somewhat scarce. Hocking has a steady, well regulated market at $3.15 per ton.

Cleveland

Aug. 7—Lake trade is still slack, and will not improve until there is a free movement from the docks in the Northwest. Local trade is quiet. Most Ohio mines are running on half-time or even less.

Middle-district coal, f.o.b. Cleveland, is $2.15 for 1¾-in., $1.90 for ¾-in., $1.80 for mine-run, $1.50@1.60 for slack. No. 8 and Cambridge, 5 or 10c. higher. Youghiogheny is $2.45@ 2.50 for lump and $2.20@2.25 for run-of-mine.

Indianapolis

Aug. 7—After an all-day session the joint meeting of the miners' and operators' officials in Brazil, last week, adjourned without reaching an agreement on the weekly payday proposition. The miners demanded that the recent law providing that the miners shall be paid weekly instead of semi-monthly be enforced, while the operators insisted that the yearly contract between the miners and operators provides that the miners shall receive their pay semi-monthly. However, the operators agreed to inaugurate the

weekly payday as soon as the present agreement between the miners and operators expires, which will be next March.

Trade remains about the same as shown by recent reports. Demand for shipment by Lake has fallen off, but the call for steam coal has improved. Most mines are working half time, or a little better.

Pittsburg

Aug. 8—Conditions in the coal market have not materially improved, and the majority of mines are running slack, with no prospects of heavier movement in the lake trade. Local demand is only fair. Prices are moderately well maintained: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton at mine.

Connellsville Coke—Two sales of furnace coke for August delivery were made last week at $1.50, totaling about 15,000 tons. In the last few days the market has become firmer, and no sales are reported at below $1.55. A producer having a large contract with a consumer found himself unable to meet fully a sudden increase in the tonnage called for, and has bought a few thousand tons in the open market at this figure, but his own production will, in future, cover the requirements, so no permanent demand has been added. A furnace at Reading and another at Youngstown, using merchant coke, are going out. Nevertheless, the general tone of the market is firmer, and we quote furnace coke for prompt delivery and on contract 5c. higher, with foundry coke unchanged: Prompt furnace, $1.55@1.60; contract, $1.70@1.75; prompt foundry, $1.85@2; contract, $2@2.25 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended July 29 at 284,297 tons, an increase of 2000 tons, and shipments at 3350 cars to Pittsburg, 4625 cars to the West and 623 cars to the East, a total of 8598 cars, an increase of one car over the preceding week.

St. Louis

Aug. 7—The coal market has been improving slowly in regard to demand, and the output has been increasing considerably. The price on lump and the larger domestic sizes has also been improving, though the price of screenings has been decreasing. However, it will only take a slight impetus now to bring prices up to where there is a fair margin to the operator.

The tonnage report for the first four days in August shows that 79,497 tons of coal passed through the St. Louis gateway. Of this amount 9147 tons was railroad coal and the balance commercial. Over 90 per cent. of this coal was used locally in St. Louis.

Domestic demand from all sections of the country is increasing, especially in the North and Northwest. Lump is in excellent demand, and all operators report that they are sold up a week or more ahead.

Prices are unchanged, except for the August advance of 10c. per ton on anthracite.

Anthracite—The market is rather dull, and the majority of the activity is from the country trade.

FOREIGN·COAL·TRADE

United States Coal Imports—Imports of bituminous coal and coke into the United States, six months ended June 30, long tons:

	1910	1911	Changes
Bituminous	924,004	693,291	D. 230,713
Coke	57,383	44,955	D. 12,428
Total	981,387	738,246	D. 243,141

Anthracite imports are not reported; they amount to only a few tons. Canada supplied this year 567,339 tons of coal and nearly all the coke; Australia, 95,684 tons coal; Japan, 25,021 tons of coal. Imports are chiefly on the Pacific Coast and in the border States of the Northwest.

United States Coal Exports—Exports of coal from United States ports, with coal furnished to steamships in foreign trade, six months ended June 30, long tons:

	1910	1911	Changes
Anthracite	1,581,385	1,706,144	I. 124,759
Bituminous	4,522,812	5,577,672	I. 1,054,860
Total exports	6,104,197	7,283,816	I. 1,179,619
Steamer coal	3,116,685	3,277,777	I. 155,092
Total	9,220,882	10,555,593	I. 1,334,711
Coke	444,920	513,271	I. 68,351

Canada took this year 5,612,537 tons of coal, or 77.1 per cent. of the total, Cuba and the West Indies took 761,813 tons of coal. The coke went chiefly to Canada and Mexico.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on July 14, as follows: Best Welsh steam coal, $4.56; seconds, $4.20; thirds, $3.96; dry coals, $4.02; best Monmouthshire, $3.84; seconds, $3.69; best small steam coal, $2.40; seconds, $1.98. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Aug. 9—Some improvement is manifest in the iron and steel trades, in volume of business. The trade is at least holding its own and there is generally a hopeful tone, which promises improvement.

In finished material more orders are reported in almost all lines. Structural steel has been limited to comparatively small orders, but a number of large contracts are in sight and will shortly be ready for negotiation. Meantime, the total of small orders is a good one. The recent cuts in bars and some other lines are gradually disappearing, and will not establish a general lower level, as was thought at first.

Pig iron drags a little behind steel. Eastern territory is taking more foundry iron, and quite a quantity of basic pig has been placed or is under inquiry. Prices hold about as they have been, buyers relying on the large idle capacity to keep them down. While business is increasing, the policy of buying for short delivery only is still generally the rule.

The congressional committee investigating the steel trust is now in session in New York, and has drawn out some interesting testimony, which is noted on another page.

Iron-ore shipments from the head of the Lakes in July are reported at 5,221,273 long tons. For the season to Aug. 1 the total shipments were 14,064,291 tons; a decrease of 7,799,258 tons from last year.

Panama Scrap—All the scrap iron and steel remaining in the Canal Zone at Panama is offered for sale by the Isthmian Canal Commission under proposals for the purchase of "French scrap." The material consists of abandoned locomotives, dump cars, tanks, barges, boilers, girders, dredges, sheet iron, parts of old machinery, and miscellaneous junk, and all other French material which has not been taken up on the property papers of the commission.

This old material is offered for sale as it lies on the Isthmus for one lump sum, without any guarantee as to the amount or condition. It is believed that there is between 45,000 and 120,000 tons, but this is merely given as a rough estimate, and no guarantee of any amount is intended. The material will be sold as it lies, all expense of removal, including breaking up, handling, and transporting by land and sea to be borne by the contractor. The Panama Railroad Company will furnish transportation to either Colon, Cristobal, or Balboa, at $2.25 per ton of 2000 lb., all loading and unloading to be performed by the contractor.

The contractor will be allowed three years in which to remove all scrap covered by the terms of the contract, it being expressly understood that the construction work of the canal must not be interfered with, and that the scrap will be flooded or covered up in the due progress of the work if not removed by the contractor before reached by construction work.

Baltimore

Aug. 7—Imports for the week included 756 tons ferromanganese from Liverpool; 1525 bars charcoal iron from Hamburg; 4346 tons iron pyrites from Huelva, Spain; 6200 tons iron ore from Cuba.

Birmingham

Aug. 7—Southern iron companies are not together as to prices, and while sales are being made right along, some orders being in quantity, there is no telling at what quotations the business is being secured. Quotations are $10@10.50 for No. 2 foundry, while on inquiries for next year's delivery $11 is asked. The recent sale of 20,000 tons of pig iron appears to be a fact, delivery thereon to be steady through the balance of the year. Immediate-delivery iron can be secured at $10 per ton still. All reports are to the effect that production is still to be held down. There is too much accumulated iron on the yards for any serious consideration to be given to an increased make. The melt in the home territory is still fairly good. There is a strong demand for cast-iron pipe, and concerns in this line cannot complain. Cast-iron pipe is being shipped in quantity from the Southern territory, the West still receiving a large quantity.

Charcoal iron is in good demand at $22.50 per ton for small lots. The scrap-iron market continues to improve.

There is further improvement in the steel market. The Southern Iron and Steel Company has started up part of its plants at Alabama City.

Chicago

Aug. 7—Quiet conditions continue in the iron market, with pig iron in steady and slightly increasing demand, and the sale of iron and steel products large in nearly every line. Foundry melters of pig iron are contracting for their needs of the last quarter chiefly, though there is much scattering business for the third quarter, and an increasing number of sales run over into the first quarter of next year. As a whole, the local market may be considered a little stronger than it was a week ago.

Northern No. 2 foundry iron sells for $14.50@15, and Southern for $10.50@11, Birmingham, which means $14.85@15.35 Chicago, the situation being better for Southern than for Northern as regards demand. Structural material continues to be most active in the finished-products market. Coke is more active, with the best Connellsville holding to $4.70 Chicago.

Cleveland

Aug. 7—Only a few scattering sales of iron ore are reported. The movement of ore for July has been fair only.

Pig Iron—Sales are small, as a rule, but there are quite a number of them. Buyers are taking iron, but have not worked up to the point of big contracts yet. Quotations, Cleveland delivery, are $15.90 for bessemer, $13.75@13.90 for basic, $14.25 for No. 2 foundry, and $14.35 for No. 2 Southern.

Finished Material—Business is again improving. New orders are better and specifications on contracts are coming in well. The shading on bars is gradually disappearing. A good contract for reinforcing bars, however, is said to have been taken at a pretty low figure.

Philadelphia

Aug. 9—Transactions in pig iron for the past week show an improvement in volume, particularly in pipe iron. Several withdrawals in quotations have just been announced, in both Northern and Southern pig. These withdrawals are made because of numerous inquiries, which makers are now convinced will result in large orders, especially to New York and New England buyers. To this extent the market is stronger, but it remains to be seen whether the higher quotations just made will be adhered to. There is a general inclination to get more for iron, especially in view of the fact that a furnace here and there is reported as pretty well sold up. The inquiries for basic pig have fallen off after a few large consumers have provided for their wants. Several orders for pipe iron have gone South. More sales for malleable have just been made, deliveries in two or three cases extending over into the fall. Foundry irons are still dragging. The latest quotation for forge is $14.50. No. 2 X foundry is $15; basic, $14.50 per ton.

Steel Billets—Latest quotations for open-hearth, $23.40; forging billets, $28.40. Recent sales are of small lots.

Bars—Sales of bars, especially refined, have picked up sufficiently to deplete stocks more than they have been for months.

Sheets—Sheets are picking up again and manufacturers report more large orders extending into late autumn delivery, but with shadings in established rates because of the size of the orders.

Pipes and Tubes—A heavy demand is on for cast pipe. Merchant pipe is extremely dull and business in tubes is dragging.

Plates—Concessions have been made on large orders for steel plates; in fact, full rates are maintained only on the smaller orders for early delivery.

Structural Material—The volume of business in structural material compares favorably for the week with previous weeks, and the usual shadings in quotations continue to be made.

Scrap—Much interest is felt in the coming sale of Panama scrap, and interested parties will be on the ground to bid intelligently. Present demand for yard stock calls for considerable scrap, and the lighter grades have been moving with more freedom than usual.

Pittsburg

Aug. 8—The iron and steel market shows no improvement in the last week, and may possibly have lost a little ground at some points. Mill operations, however, show a slight increase, due to the better rate of buying already established. Buyers show a greater disposition to place contracts, and the mills can book without difficulty for much larger tonnage than formerly, but actual orders for early rolling are no easier to obtain than one week or two weeks ago.

Shading in merchant bars and plates continues. Practically all the prompt business in bars in the West is being booked at 1.20c., Pittsburg, and 1.15c. is sometimes done. Locally the 1.25c. price is being obtained on much, if not the majority, of the business. In plates, shading of $1 per ton is fairly general on prompt business. Structural shapes appear to be fairly firm. There are reports of cutting, but in some quarters they are considered the firmest item in the list.

Pig Iron—The Westinghouse Electric and Manufacturing Company has bought about 12,000 tons of foundry pig iron, about equally divided between its Allegheny and Cleveland plants, delivery September to March, inclusive. The Allegheny business is understood to have gone at about $14.25, delivered, or $13.35 @ 13.50 at furnace, according to location, for this year's delivery, and 25c. higher for next year's delivery. The Cleveland iron was probably secured at a materially lower delivered price. There has been continued buying of foundry iron in a small way, consumers not caring to buy ahead. Bessemer and basic iron have been very quiet, basic being considerably firmer; it is even maintained in some quarters that $13, Valley, can no longer be done, although this figure could be shaded by 25c. up to two or three weeks ago, as demonstrated by actual purchases. We continue to quote: Bessemer, $15; basic, $13@13.25; No. 2 foundry, $13.50@13.75; malleable, $13.25@13.50; forge, $13@13.25, all at Valley furnaces; 90c. higher delivered at Pittsburg.

Ferromanganese—The market continues quiet, and sellers appear to be holding the new price of $37, Baltimore, for prompt or delivery through the first quarter. Freight to Pittsburg is $1.95 per ton.

Steel—The Kokomo Steel and Wire Company is inquiring for its supply of billets for second half, involving 40,000 or 50,000 tons for its rod mill, but it is doubtful if Pittsburg mills will get the business. Sheet-bar deliveries on contract are fairly good, while billet deliveries continue light. We quote, f.o.b. maker's mill, Pittsburg or Youngstown, $21 for billets and $22 for sheet bars, while rods are $27, Pittsburg.

Sheets—The sheet market has not improved, and may be somewhat duller than last week, while there is considerable Locally, the only shading is that on shading in Ohio and the Chicago district. prompt business; the mills frequently give away the extra $1 a ton over the

Pittsburg basis, which they usually charge for actual Pittsburg delivery. Regular prices remain: Black sheets, 28 gage, 2c.; galvanized, 3c.; blue annealed, 1.50c.; painted corrugated roofing, $1.40 per square; galvanized, $2.55 per square.

St. Louis

Aug. 7—The market locally has been rather slow, though a number of small orders have been booked, and business in the aggregate is fair. The price of $10 @10.25, Birmingham, or $13.75@14, St. Louis, for No. 2 foundry remains unchanged, though it begins to look as if the $10 quotation would be withdrawn before long.

Iron Ore Markets

United States Iron Ore Movement—Imports and exports of iron ore in the United States, six months ended June 30, long tons:

	1910	1911	Changes
Imports	1,159,266	801,868	D. 357,398
Exports	242,411	231,404	D. 11,007

The imports this year included 538,300 tons from Cuba, 88,974 from Spain, 114,529 from Sweden 34,410 from Newfoundland, and 20,702 from Canada.

Imports of manganese ore into the United States, six months ended June 30, were 116,462 tons in 1910, and 83,188 in 1911; decrease, 33,274 tons.

METAL MARKETS

New York, Aug. 9—The metal markets show some improvements in demand, but no marked changes. The spelter market is rather irregular.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
June 1911..	$3,074,755	$ 4,767,714	Imp.$ 1,692,959
" 1910..	1,598,347	4,575,917	Imp. 1,279,212
Year 1911..	13,251,562	33,773,026	Imp. 20,521,464
" 1910..	49,516,731	19,390,531	Exp. 30,126,200
Silver:			
June 1911..	5,777,703	3,506,446	Exp. 2,271,257
" 1910..	4,587,383	3,308,171	" 1,279,212
Year 1911..	34,443,203	21,960,601	" 12,482,602
" 1910..	27,054,218	21,901,520	" 5,152,698

Exports from the port of New York, week ended Aug. 5: Gold, $150,100, nearly all to Panama; silver, $1,318,699, chiefly to London. Imports: Gold, $152,609; silver, $147,661, from the West Indies and South America.

Gold—Prices on the open market in London remained at the normal level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. The supplies were taken for India, Egypt and the Bank of England. In New York $500,000 was taken for shipment to Canada.

Sales of gold bars from the New York Assay Office, to jewelers and others for use in the arts, were $1,862,176 in July, being the largest reported for several years in that month, which is usually a quiet one. For the seven months ended July 31, the total sales were $15,728,110, an increase of $779,169 over last year.

Iridium—This metal is steady, $62 per oz. being still asked.

Platinum—The market is quiet and firm. Dealers ask $43.50 per oz. for refined platinum and $46 for hard metal. The foreign market is still reported strong.

Silver—The market has fluctuated between 24 3/16 and 24 1/16d. in London, without special feature, and closes firm on buying by Chinese banks.

SILVER AND STERLING EXCHANGE

Aug.	3	4	5	7	8	9
New York....	52⅛	52⅜	52⅜	52⅜	52⅛	52⅛
London ...	24⅛	24⅜	24⅜	....	24⅛	24⅛
Sterling Ex..	4.8600	4.8600	4.8605	4.8605	4.8605	4.8595

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, from Jan. 1 to July 27, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£3,576,600	£4,895,300	I. £1,318,700
China	1,113,500	890,400	D. 223,100
Total	£4,690,100	£5,785,700	I. £1,095,600

India Council bills in London brought an average of 16.04d. per rupee.

Foreign trade of the United States, half-year ended June 30, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1910	1911
Exports	$ 804,759,245	$ 987,591,733
Imports	799,423,498	764,504,935
Excess, exports	I. $5,335,747	E.$223,086,798
Add excess of exports, silver		12 482,602
Add excess of exports, gold		20,521,464
Total export balance		$ 256,090,864

The gold and silver movement in detail is given in the table at the head of this column.

Copper, Tin, Lead and Zinc

LONDON

Aug.	Copper Spot	Copper 3 Mos	Copper Best Sel'td	Tin Spot	Tin 3 Mos	Lead, Spanish	Zinc, Ordinaries
3	56¼	56⅛	60½	190½	188	13 1/16	25¾
4	56 7/16	57⅛	60½	192¼	188¼	13⅞	25¾
5	.....	.....	.....	.....	.....	....	....
7	....	....	...	.....	.....	....	....
8	56⅜	57⅛	60½	194½	189	13⅞	25¾
9	56¾	57⅛	60½	193¾	188¾	13 1/16	25¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

NEW YORK

Aug.	Copper Lake, Cts. per lb.	Copper Electrolytic, Cts. per lb.	Tin Cts. per lb.	Lead New York, Cts. per lb.	Lead St. Louis, Cts. per lb.	Zinc New York, Cts. per lb.	Zinc St. Louis, Cts. per lb.
3	12⅝ @12¾	12.40 @12.45	42	4.50	4.42½ @4.45	5.80 @5.90	5.65 @5.75
4	12⅝ @12¾	12.40 @12.45	42½	4.50	4.42½ @4.45	5.85 @5.90	5.70 @5.75
5	12⅝ @12¾	12.40 @12.45	42½	4.50	4.42½ @4.45	5.85 @5.90	5.70 @5.75
7	12⅝ @12¾	12.40 @12.45	42⅝	4.50	4.42½ @4.45	5.85 @5.95	5.70 @5.80
8	12⅝ @12¾	12.40 @12.45	42¾	4.50	4.42½ @4.45	5.90 @5.95	5.75 @5.80
9	12⅝ @12¾	12.40 @12.45	42⅝	4.50	4.42½ @4.45	5.90 @6.00	5.75 @5.85

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Conditions in the market are not materially changed from last week. Business has been quiet, but the market has a firm tone, but shows no present tendency to advance. The issue of the Producers' Association statement had no apparent effect. The inquiry on the part of domestic consumers has been fair, but did not tend to put more life into the market. Orders were readily booked at the old prices. The close is unchanged at 12⅝@12¾c. for Lake; 12.40@12.45c. for electrolytic in cakes, wirebars or ingots, while casting copper is quoted nominally at 12⅛@12¼c. for the week.

Speculation in the London market has subsided and transactions are becoming almost insignificant. While fluctuations are small, the underlying tendency remains firm, and the close is cabled at £56 7s. 6d. for spot and £57 2s. 6d. for three months.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

Exports of copper from New York for the week were 6653 long tons. Our special correspondent gives the exports from Baltimore for the week at 1145 tons.

Tin—The London market remains firm, although activity has dwindled considerably. The Syndicate has suspended operations for the present, and as it has the spot situation well in hand, can safely leave the market to its fate at this time. The close is cabled as £193 15s. for spot and £188 15s. for three months prompt.

Business in this market has been satisfactory. There is, however, danger of a scarcity of spot tin. The dock strikes in London have prevented shipments from there, and the tin now incoming has mostly been sold to consumers. At the present time, spot tin is selling at

about 43⅛c., while August tin is quoted at 42⅝ cents.

Lead—Business in this metal has become smaller, and in consequence thereof the tone is somewhat easier. Quotations, however, remain unchanged at 4.50c., New York, and 4.42½@4.45c., St. Louis, the latter quotation remaining relatively high.

The London market has reacted somewhat from its high point, but still remains firm, and closes at £13 16s. 3d. for Spanish and £13 18s. 9d. for English.

Spelter—The continued strikes in two of the Western works, which at the present time seem to be far from a settlement, have increased the inherent strength of this metal. Producers have only small stocks on hand, and are forced to raise their prices with each order received. In consequence, values advanced almost from day to day, and close firm at 5.90@6c., New York, and 5.75@5.85c., St. Louis. The market continues somewhat irregular, and on some days there has been an unusually wide margin in the quotations.

Europe also reports a continued scarcity of the metal and an extremely firm market. Quotations are unchanged at £25 15s. for good ordinaries and £26 for specials.

Zinc dust is quoted at 6¼c. per lb., New York.

Base price of zinc sheets has been advanced ¼c. and is now $7.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of July 29, that the market is again active and stronger. Quotations for ordinary brands are 50.75 marks per 100 kg.—equal to 5.43c. per lb.—f.o.b. works in Silesia; for specials, 51.75 marks. For September delivery, 52 marks is asked. Zinc sheets are quoted at 59.85@61.85 marks per 100 kg.—average 6.57c. per lb.—for ordinary numbers, f.o.b. works. Zinc dust is quoted at 46.50@47.50 marks per 100 kg.—average 5.07c. per lb.—f.o.b. Stettin.

Other Metals

Aluminum—The market shows a little more life, but prices are unchanged. Quotations continue 20@20½c. per lb. for No. 1 ingots, New York.

Antimony—Some more inquiry is reported, but few actual sales. Cookson's is still quoted at 8.50c. and Hallett's at 8c. per lb.; while 7.25@7.50c. per lb. is had for Chinese, Hungarian and other outside brands.

Quicksilver—Business continues on a good scale, and prices are unchanged. The New York quotation is $48@49 per flask of 75 lb., with the usual advances for small lots. San Francisco quotes $48 for domestic orders and $45.50 for export. The London price is £8 15s. per flask, with £8 10s.@£8 15s. named from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The price is slightly lower, the latest quotation being 700@725 marks per 100 kg.—75.5@78.3c. per lb.—at works in Germany, according to quantity.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, six months ended June 30, are reported as follows, in the measures usual in the trade:

Metals:	Exports	Imports	Excess
Copper, long tons	170,517	75,392	Exp. 95,125
Copper, 1910....	131,516	75,576	Exp. 55,940
Tin, long tons....	599	23,866	Imp. 23,267
Tin, 1910.....	511	22,471	Imp. 21,960
Lead, short tons.	51,106	45,958	Exp. 5,148
Lead, 1910.....	34,629	49,388	Imp. 14,759
Spelter, sh. tons.	3,876	1,176	Exp. 2,700
Spelter, 1910....	912	2,060	Imp. 1,148
Nickel, lb.....	11,156,935	14,279,760	Imp. 3,122,825
Nickel, 1910....	7,454,092	16,387,546	Imp. 8,933,454
Antimony, lb.....	160,844	5,554,330	Imp. 5,393,486
Antimony, 1910.	2,726	5,110,349	Imp. 5,107,623
Platinum, oz.....	47	50,310	Imp. 50,263
Platinum, 1910.	48	55,556	Imp. 55,508
Aluminum, value	$664,219	.....	Exp. $664,219
Aluminum, 1910	283,496	.....	Exp. 283,496
Ores, etc.:			
Zinc oxide, lb. . .	14,597,739	.....	Exp. 14,597,739
Zinc oxide, '10..	13,061,762	.....	Exp. 13,061,762
Zinc dross, lb....	4,981,630	.....	Exp. 4,981,630
Zinc dross, '10..	5,772,935	.....	Exp. 5,772,935
Zinc ores, lg. tons	9,857	24,509	Imp. 14,652
Zinc ores, 1910.	10,066	33,034	Imp. 22,968
Chrome ore, tons	5	22,868	Imp. 22,863
Chrome ore, '10	30	23,288	Imp. 23,258

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Imports of aluminum are not given. The exports given above include reëxports of foreign material. Zinc contents of ores imported were 25,275,066 lb. in 1910, and 16,372,822 lb. in 1911. There were reëxported foreign ores containing 1,734,968 lb. zinc in 1910, and 2,456,568 lb. this year.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 5—The high price of zinc sulphide ore was $44, and the assay base price $39@42 per ton of 60 per cent. zinc. Zinc silicate sold at $21@23 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $39.10. The highest price for lead ore was $62, and the average price, all grades of lead, was $60 per ton.

Friday 4.22 in. of rain fell, making a total for the week of nearly 7 in., and over a foot for the fortnight. The mines were scarcely recovered from last week when this week's downpour refilled the ground with water. In some sections of the district the later rainfall was more severe than the previous one, filling a majority of the Galena mines this time. Another week of very short outputting capacity is assured, and with a portion of the mines the additional volume of water will further delay an ultimate drainage.

On account of the strike among the smeltermen of the American Zinc, Lead and Smelting Company, that company made no shipment of ores from the district, indicating that the situation is more serious than has been the accepted belief here. The information from Deering tonight is that the strikers have temporary control of the situation, having refused all overtures of the company, and the fact that no ore was shipped from here presages a prolonged struggle.

The fact that this company is making no purchases, and is even turning its contract ore to other smelters, lightens what otherwise might cause a tension among smeltermen for the limited output of the zinc mines. The reserve stock, aside from several bins that are being held for $50 and $60 per ton prices, by persons who will sell for no less, is no more than what is left in the bins after the week's loading is done by the shippers—about one normal week's production. This with the limitation by floods, puts a wholly different phase on the local situation from any heretofore existing

SHIPMENTS, WEEK ENDED AUG. 5

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,096,850	.....	927,870	$90,237
Joplin.....	1,797,180	.....	224,660	44,533
Galena.....	754,670	.....	114,640	18,589
Alba-Neck....	645,740	.....	25,410	14,320
Duenweg.....	486,670	.....	95,710	12,651
Oronogo.....	191,200	.....	68,830	5,723
Spurgeon	120,050	116,290	40,790	4,864
Aurora.....	147,640	127,700	.....	4,358
Granby.....	160,090	98,100	17,670	4,300
Cave Springs.	124,790	.....	.....	2,620
Lawton	91,150	.....	.....	1,914
Jackson.....	67,460	.....	10,930	1,682
Miami.....	111,740	.....	.....	1,676
Quapaw.....	65,430	....	.....	1,308
Carl Junction	52,280	.....	.....	1,150
Totals.....	7,912,940	342,090	1,526,510	$209,985
31 weeks...	302,603,920	20,162,510	52,759,530	$7,657,579
Blende val., the week, $159,601; 31 weeks,				$5,939,851
Calamine, the week,	3,844; 31 weeks,			2 3,295
Lead value, the week,	46,540; 31 weeks,			1,484 433

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1910	1911	1910	1911	1910	1911
January.....	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February....	40.69	40.21	39.47	39.16	53.64	54.46
March.....	43.60	39.85	39.71	38.45	51.26	54.57
April.....	41.00	38.88	39.33	37.47	49.72	56.37
May.....	40.19	38.25	37.51	36.79	48.16	55.21
June.....	40.20	40.50	37.83	38.18	48.80	56.49
July.....	39.63	40.75	36.80	38.36	48.59	58.81
August.....	40.13	.....	37.32	.....	49.75	.....
September..	43.45	.....	39.96	.....	54.73	.....
October.....	43.31	.....	40.50	.....	53.18	.....
November...	47.20	.....	43.20	.....	54.80	.....
December...	42.50	.....	40.70	.....	55.70	.....
Year.....	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

this year. The fortnight production is off fully 5000 tons, and it will be short for another fortnight at least. Sellers for the first time are loath to accept existing offerings, expecting each week to bring higher prices.

Platteville, Wis., Aug. 5—The base price paid this week for 60 per cent. zinc ore was $41 per ton; ore buyers were restricted in purchases and ceased buying at the week end, owing to labor trouble at the smelteries. The base price paid for lead ore was $55@56 per ton, but no lead was shipped.

SHIPMENTS, WEEK ENDED AUG. 5

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	759,170	.....	.....
Platteville	629,570	.....	213,120
Galena	417,300	.....	.....
Benton	327,450	.....	.....
Hazel Green	320,000	.....	.....
Highland	310,000	.....	.....
Montfort	81,670	.....	.....
Harker	65,740	.....	.....
Rewey	61,000	.....	.....
Total	2,971,900	.....	213,120
Year to date	91,729,089	4,962,235	19,227,110

Shipped during the week to separating plants, 2,401,200 lb. zinc ore.

CHEMICALS

New York, Aug. 9—The general market shows a little more life, and sales are reported to be increasing in several lines.

Copper Sulphate—On a moderate business, supplies are a little better, but prices are unchanged, $4.50 per 100 lb. being quoted for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—The market seems to be falling into quiet again, the special demand having been largely satisfied. Prices are easier, $2 per 100 lb. being quoted for spot lots of white arsenic; while $1.75 per 100 lb. is still named for futures.

Imports and Exports—Imports and exports of chemicals and raw material in the United States, five months ended May 31:

	Imports	Exports	Excess
Copper sulph. lb.	.....	6,216,692 E.	6,216,692
Copper sul., '10	.....	3,439,783 E.	3,439,783
Bleach, lb.	45,082,158	17,368 I.	45,064,790
Bleach, 1910	46,544,978	..... I.	46,544,978
Potash salts, lb.	365,866,586	2,138,170 I.	363,528,416
Potash salts, '10	293,117,245	2,001,428 I.	291,115,817
Soda salts, lb.	16,065,397	288,435 I.	15,776,962
Soda salts, 1910	16,809,329	274,778 I.	16,534,551
Acetate lime, lb.	.....	39,614,983 E.	39,614,983
Acetate, 1910	.....	33,727,057 E.	33,727,057
Nit. of soda, tons	318,641	3,392 I.	315,249
Nitrate, 1910	301,223	4,154 I.	297,069
Phosphates, tons	.....	619,421 E.	619,421
Phosphates, '10	.....	496,013 E.	496,013
Sulphur, tons	10,902	4,838 I.	6,062
Sulphur, 1910	16,032	18,316 E.	2,284
Pyrites, tons	479,620	..... I.	479,620
Pyrites, 1910	309,331	..... I.	309,331
Magnesite, lb.	138,940,201	1,361,037 I.	137,579,164
Magnesite, 1910	103,049,329	3,502,872 I.	99,546,457
Sul. ammonia, lb.	92,654,197	..... I.	92,654,197
Sul. am'nia, '10	70,838,871	576,306 I.	70,262,565
Arsenic, lb.	2,480,024	3,000 I.	2,477,024
Arsenic, 1910	3,707,548	2,912 I.	3,704,636

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites, the total imports of sulphur this year were 201,750 tons.

Nitrate of Soda—Business remains good. Prices are firm, 2.15@2.17½c. per lb. being paid for spot; 2.17½c. for deliveries through the balance of 1911, and 2.20c. for 1912 deliveries.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Aug. 1 as follows, in long tons:

	1910	1911	Changes
Stocks, Jan. 1	14,000	12,790	D. 1,210
Imports, 8 mos	285,100	334,922	I. 49,822
Total supplies	299,100	347,712	I. 48,612
Deliveries, 8 mos	286,700	333,059	I. 46,359
Stocks, Aug. 1	12,400	14,653	I. 2,253
Afloat for U. S.	60,000	50,000	D. 10,000

Quantities afloat include all cargoes due to arrive at United States ports by Nov. 15 next.

Petroleum

Production of petroleum in California for the six months ended June 30 is reported at 40,366,822 bbl., an increase of 3,581,848 bbl., or 8.9 per cent. over 1910. Deliveries were 34,262,005 bbl., an increase of 1,974,362 bbl., or 5.8 per cent. Stocks on June 30 were 37,993,468 bbl., an increase of 6,104,217 bbl. during the half-year.

MINING STOCKS $

New York, Aug. 9—Early in the week there was a break in prices in the general market, and nearly all stocks lost, though the recessions were not heavy. Later nearly all the losses were recovered. The movement was altogether an inside one, for the public is still doing practically nothing.

The mining stocks on the Curb were dull and irregular. Sales were few and price changes unimportant. Cobalt and Porcupine stocks reported more dealings than any others. Coppers were slow, even Braden, which has been very active of late, reporting few sales. Standard Oil was a little stronger, but irregular.

The death of Col. W. C. Greene brought out some gossip about the man who was such a prominent figure a few years ago.

At auction in New York, Aug. 3, a lot of 200 shares Chelan Consolidated Copper Company brought $7 for the lot; 500 shares American & Mexican Mines Company, $12 for the lot.

Boston, Aug. 8—No encouragement can be gleaned from the copper-share market. Prices are weak and trading light, even less so than during the ordinary midsummer period. Even in the face of the Copper Producers' statement, prices went lower. This, however, was due to the liquidation and weakness of the Wall Street market.

It would seem as if prices were grinding on bottom, so thorough has been liquidation in copper shares. Calumet & Hecla fell to $425 today, which is the lowest price it has touched since 1903. In the meantime it has sold as high as $1000 per share. Under Calumet management the Tamarack mine's output is being restricted to a basis of less than 5,000,000 lb. per annum. The July output was over 50 per cent. less than last year.

North Butte is off almost $2, touching $30.37½ today. Others to show marked declines have been Amalgamated Copper,

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	May	June	July
Alaska shipments	3,092,000	.....	.....
Anaconda	22,100,000	21,850,000	21,900,000
Arizona, Ltd.	2,800,000	2,700,000	.....
Balaklala	978,426	.....	.....
Copper Queen	7,140,196	7,088,862	6,373,062
Calumet & Ariz.	3,854,000	3,656,000	4,394,000
Detroit	1,709,530	1,732,692	1,590,357
East Butte	1,135,000	841,200	.....
Nevada Con.	5,277,355	5,307,400	.....
Old Dominion	2,363,000	1,907,000	2,114,000
Shannon	1,229,760	1,098,000	1,150,000
South Utah	318,350	158,661	.....
United Verde*	3,000,000	3,000,000	3,000,000
Utah Copper Co.	8,391,879	7,908,685	.....
Lake Superior*	19,000,000	19,800,000	.....
Non-rep. mines*	10,188,000	14,625,000	.....
Total production	92,577,496	91,673,500	.....
Imports, bars, etc.	19,481,190	22,348,964	.....
Total blister	112,058,686	114,022,464	.....
Imp. in ore & matte	6,801,365	4,744,912	.....
Total	118,860,051	119,767,376	.....
Brit. Col. Cos.:			
British Col. Copper	976,121	.....	.....
Granby	1,238,328	.....	.....
Mexican Cos.:			
Boleo	2,411,500	2,315,040	.....
Cananea	4,098,000	3,462,000	.....
Moctezuma	2,403,583	2,071,960	2,340,404
Other Foreign:			
Cape Cop., S. Africa	1,001,280	.....	.....
Spassky, Russia	586,880	.....	.....
Exports from:			
Chile	7,392,000	3,960,000	.....
Australia	11,088,000	7,168,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
VII, 1910	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424 316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658

	Visible Stocks.		
	United States.	Europe.	Total.
VIII, 1910	170,640,678	222,320,000	392,960,675
IX	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

which fell over $4; Grand, $4; Nevada Consolidated, $1.50; Old Dominion, $3.50; United States Smelting, $1.75; Utah Consolidated, $1.25.

On the Curb trading has been light, and the trend of prices has been in keeping with the big market.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev.	July 31	Aug. 21	$0.10
Bonanza Mountain, Ida.	Aug. 15	Sept. 9	0.001
Bullion, Ida.	July 17	Aug. 17	0.005
Bullion, Nev.	Aug. 3	Aug. 25	0.05
Calumet, Ida.	Aug. 15	Sept. 15	0.001
Challenge, Nev.	Aug. 17	Sept. 7	0.05
Chollar, Nev.	July 18	Aug. 10	0.10
Copper King, Ida.	Aug. 15	Sept. 16	0.01
Crown Point, Nev.	July 24	Aug. 11	0.10
Dalmatia, Ida.	Aug. 3	Sept. 4	0.002
Douglas, Ltd., Ida.	Aug. 25	Sept. 26	0.001
Hypotheek, Ida.	July 28	Aug. 19	0.C05
Ida. Copper, Ida.	Aug. 10	Sept. 1	0.003
Iron Mask, Ida.	Aug. 12	Aug. 31	0.002
Nine Mile, Ida.	June 15		2.00
Ojibway, Mich.	Aug. 15		1.00
Pretoria, Ida.	Aug. 15	Sept. 15	0.000½
Seven Troughs Mon., Utah.	Aug. 12	Sept. 6	0.002½
Sierra Nevada, Nev.	July 21	Aug. 11	0.10
Silver Bell, Utah.	July 29	Aug. 19	0.01
Spider, Utah.	Aug. 15	Sept. 15	0.002½
Torino, Ida.	Aug. 15	Sept. 15	0.001
Utah United Copper, Utah.	June 24		0.01
Victoria, Mich.	Aug. 21		1.00
Wabash, Utah.	Aug. 12	Sept. 2	0.10
Yankee Con., Utah.	Aug. 18	Sept. 4	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12 668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12 914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	42.400
February	32.920	41.614	August	33.972	.....
March	32.403	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	43.115	November	36.547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12·582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5 452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23 050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15 90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15 90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15 84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Aug. 8

Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.01½
C. K. & N.	.12
Doctor Jack Pot	.06
Elkton Con.	.59½
El Paso	.49
Findlay	.04
Gold Dollar	.15
Gold Sovereign	.02
Isabella	.10½
Jack Pot	.06
Jennie Sample	‡.09½
Lexington	‡.01
Moon Anchor	.02
Old Gold	.02½
Mary McKinney	.35
Pharmacist	‡.01½
Portland	.97½
Vindicator	.75
Work	‡.01

SALT LAKE Aug. 8

Name of Comp.	Bid.
Beck Tunnel	.15½
Black Jack	.12
Carisa	‡.20
Cedar Talisman	.03½
Colorado Mining	.42½
Columbus Con	.31
Daly Judge	4.25
Grand Central	.62
Iron Blossom	‡1.05
Little Bell	‡.44
Lower Mammoth	.02
Mason Valley	8.25
May Day	.12
Nevada Hills	3.75
New York	‡.13½
Prince Con	.71
Silver King Coal'n	1.60
Sioux Con	.22
Uncle Sam	.49
Yankee	.15

TORONTO Aug. 8

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.50	Pearl Lake	.52
Hudson Bay	.75	Porcu. Gold	.50½
Temiskaming	.41	Porcu. Tisdale	.02
Wettlaufer-Lor	.84	Preston E. D.	.30
Apex	.16	West Dome	1.95
Central	.74	Standard	.04
Dobie	1.25	Canada	‡1.10
Dome Exten	.69	Rea	3.80
Hollinger	10.70	Coronation	.17½
Imperial	.05	Swastika	.45½

SAN FRANCISCO Aug. 8

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	‡.06
Belcher	.46
Best & Belcher	.18
Caledonia	.51
Challenge Con	.11
Chollar	.13
Confidence	‡.64
Con. Virginia	.75
Crown Point	.46
Gould & Curry	.11
Hale & Norcross	.19
Mexican	3.90
Occidental	.65
Ophir	1.85
Overman	.37
Potosi	.20
Savage	.11
Sierra Nevada	.52
Union Con	1.40
Yellow Jacket	.36

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	6.72½
Jim Butler	.29
MacNamara	.18
Midway	.17
Mont.-Tonopah	.70
North Star	.14
West End Con.	.54
Atlanta	.19
Booth	.09
C.O.D. Con	.09
Comb. Frac	.09
Jumbo Extension	.22
Oro	.05
Silver Pick	.06
St. Ives	.35
Tramps Con	.02
Argonaut	2.05
Bunker Hill	‡7.00
Cent. Eureka	1.10
So. Eureka	‡7.00

N. Y. EXCH. Aug. 8

Name of Comp.	Clg.
Amalgamated	64¼
Am. Agri. Chem.	56
Am.Sm.&Ref.,com	73⅞
Am. Sm.& Ref., pf.	105½
Anaconda	36¾
Batopilas Min	1½
BethlehemSteelpf	61
Chino	21⅛
Comstock Tunnel	‡.24
Federal M.& S., pf.	‡64½
Goldfield Con	5¾
Great Nor., ore ctf.	53
Homestake	82¾
Miami Copper	21
Nat'nalLead,com.	52¾
National Lead, pf.	108½
Nev. Consol	17¾
Pittsburg Coal, pf.	86
Ray Con	15⅞
RepublicI&S,com	28
Republic I & S, pf.	93⅜
SlossSheffi'd,com.	47
Sloss Sheffield, pf.	‡112
Tennessee Copper	34¾
Utah Copper	46
U. S. Steel, com.	74⅞
U. S. Steel, pf.	116⅞
Va. Car. Chem	55½

N. Y. CURB Aug. 8

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	5
B. C. Copper	4½
Buffalo Mines	‡1½
Butte & Vipond	.54
Butte Coalition	17½
Calumet & Mont.	‡.20
Cobalt Central	.01
Con. Ariz Sm.	¾
Davis-Daly	⅞
Ely Con	½
Florence	1⅝
Giroux	5⅜
Greene Cananea	2
Greenwater	05
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp.	‡205
Inspiration	7¾
Internat. S. & R.	‡124
Kerr Lake	5
La Rose	4
McKinley-Dar-Sa.	1½
Min. Co. of A. new	5⅛
Moneta Porc	‡.17
Mont Shoshone	‡.04
Nev. Utah M. & S.	.1
New Baltic	‡6½
Nipissing Mines	8⅜
Ohio Copper	1
Pacific Sm. & M.	¼
Precious Metals	‡⅜
Ray Central	1½
Red Warrior	‡1½
South Utah M. & S.	¾
Standard Oil	605
Stewart	.89
Tonopah	5.11
Tonopah Ex	.85
Tri-Bullion	⅜
Tularosa	⅜
Union Mines	‡.16
Yukon Gold	4

LONDON Aug. 9

Name of Com.	Clg.
Camp Bird	£1 9s 0d
Dolores	1 10 0
El Oro	1 3 0
Esperanza	1 17 0
Mexico Mines	7 1 3
Oroville	0 6 0
Stratton'sInd.	0 2 3
Tomboy	0 19 4½

BOSTON EXCH. Aug. 8

Name of Comp.	Clg.
Adventure	6
Algomah	‡8½
Allouez	28¾
Am. Zinc	28
Arcadian	2¾
Arizona Com	14¾
Atlantic	‡6
Bonanza	.50
Boston & Corbin	11¾
Butte & Balak	4¾
Calumet & Ariz	54½
Calumet & Hecla	425
Centennial	11
Con. Mercur	.07
Copper Range	58¼
Daly-West	5½
East Butte	13¾
Franklin	10¾
Granby	33¾
Hancock	24
Hedley Gold	15¼
Helvetia	1
Indiana	12
Isle Royale	15
Keweenaw	2½
Lake	33
La Salle	3½
Mass	7¼
Michigan	2
Mohawk	45
New Arcadian	‡2¾
North Butte	30¾
North Lake	6
Ojibway	5½
Old Dominion	42½
Osceola	98
Parrot	11½
Quincy	68
Shannon	10⅛
Shattuck-Ariz	17
Superior	27
Superior & Bost.	5¼
Tamarack	‡34
Trinity	3⅝
Tuolumne	4
U. S. Smelting	36
U. S. Smelt'g, pf.	48
Utah Apex	2¾
Utah Con	16
Victoria	1½
Winona	7½
Wolverine	108
Wyandot	1½

BOSTON CURB Aug. 8

Name of Comp.	Last
Ahmeek	165
Bingham Mines	1½
Boston Ely	1⅜
Boswyocolo	.11
Cactus	10
Calaveras	‡2
United Verde Ext.	.75
Chief Cons	92
Corbin	2½
Cortez	1½
Crown Reserve	3⅜
First Nat. Cop.	1
Live Oak	21½
Majestic	.48
Mazatan	1
Nat'l Mine & Ex.	.16
Nevada-Douglas	1½
Oneco	1⅜
Raven Copper	32
Rhode Island Coal	1⅜
San Antonio	‡3½
South Lake	6½
Trethewey	‡2
United Zinc, pfd.	‡2
Vulture	5
Yuma	‡.02

‡Last quotation.